

Clinical Forum

Lexical Development and Retrieval in Treating Children Who Stutter

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Although the research on typically developing children is replete with studies of semantic and lexical acquisition, this area of linguistic development has received limited attention in the stuttering literature (see Bernstein Ratner, 1997, for review). Yet, as pointed out by Dr. Weiss in the prologue, it is important to examine multiple aspects of language and their interactions when considering the onset and development of stuttering and its treatment. This article describes the role of lexical acquisition in stuttering in three respects by discussing (a) how children learn words, (b) the relationship between lexical and syntactic development and the emergence of disfluencies in typically developing children, and (c) what is known about these phenomena in children who stutter (CWS). A discussion of the role of linguistic "trade-offs," or dysynchronies, among language skills in the possible onset and development of stuttering is presented. The article concludes with a discussion of treatment implications in the context of case examples.

ABSTRACT: This article describes the role of lexical acquisition in stuttering by examining the research on word learning and interactions between semantics and syntax in typically developing children and children who stutter. The potential effects of linguistic mismatches, or dysynchronies in language skills, on the possible onset and development of stuttering are discussed. The article concludes with assessment and treatment considerations.

KEY WORDS: stuttering, language development, lexical development, stuttering treatment, children

LEXICAL DEVELOPMENT IN TYPICAL CHILDREN

How Words Are Acquired

The process of learning new words is complex, and yet most young children seem to acquire words effortlessly. Typically developing children rely on processes of comprehension to store lexical items and on processes of production to retrieve the items, practice using them, and, subsequently, learn more words. In order to store and retrieve lexical items successfully, children must make use of the phonological, semantic, and syntactic characteristics of the words in the linguistic process of encoding. The ways in which children map meaning on to vocabulary words, and store and retrieve lexical items via phonologic, semantic, or syntactic routes, are varied and individual. Yet, it is known that young children frequently learn new words and use them correctly after only a few exposures to them. This incidental word learning is known as fast mapping (Carey, 1978) and has been studied in typical children as well as children with language impairment (e.g., Dollaghan, 1987; Ellis Weismer & Hesketh, 1993, 1996, 1998; Gray, 2003; Rice, Buhr, & Nemeth, 1990; Rice, Buhr, & Oetting, 1992; Rice, Oetting, Marquis, Bode, & Pae, 1994). To date, however, this word learning strategy has not been examined in CWS. Looking at the ways in which CWS fast map lexical information and later retrieve it may prove to be significant in understanding the role linguistic development plays in the onset and development of stuttering.

In addition to fast mapping is the developmental process of "slow mapping," the prolonged period of lexical

development in which children learn to differentiate newly acquired words from already-held semantic representations and develop hypotheses about the meanings of words (Carey, 1978; McGregor, Friedman, Reilly, & Newman, 2002). In a recent investigation of semantic representation in typical children during a period of slow mapping, McGregor and colleagues (2002) examined the ability of 25 children between the ages of 4;0–6;6 (years;months) to name, describe, and illustrate object words. By detailing the extent of children's descriptions, the elaboration of their drawings, and the errors produced in naming pictured objects, McGregor et al. were able to determine some of the characteristics and the stability of young children's semantic representations. In large measure, it was found that children typically made taxonomic semantic errors in naming. That is, the incorrect lexical item used was within the same semantic category as the target item, as opposed to a phonologic error in which the incorrect item shared phonologic, but not semantic, characteristics with the target. Further, these children most often provided information on the physical features (and less frequently, the functional properties) of objects in their verbal descriptions.

The authors concluded that the types of semantic errors exhibited by these children revealed important information on the continuing fragility of their semantic and lexical systems. Specifically, McGregor et al. (2002) identified three types of semantic errors and suggested that these errors reflect certain characteristics of the word's underlying representation. The first type of error revealed what the authors termed "lexical gaps," as children provided incorrect lexical items because representation of the target item was missing from their mental lexicons. The second semantic error type occurred because the underlying representation of the target item was "fragile," meaning the children did not know the target item well enough to produce it consistently error-free. The third error type was identified as those errors in which the children temporarily forgot the target.

Although yet to be conducted with CWS, research of this kind is significant for understanding the complex processes of language acquisition in those children as well as in children with normal fluency. In particular, understanding that errors in word learning and naming may provide valuable insight into the stability of a developing lexical system may enhance the interpretation of language performance in CWS and, thus, help to determine the nature of interactions between language and stuttering.

RELATIONSHIP BETWEEN LEXICAL DEVELOPMENT AND SYNTACTIC DEVELOPMENT

Assuming a substantial connection between vocabulary and syntax, it is likely that the ways in which, and the pace at which, a youngster learns to store and retrieve vocabulary will affect that child's grammatical development. In fact, research has indicated that lexical growth and

the expansion of grammar are closely linked, such that children who exhibit dramatic increases in vocabulary are those who demonstrate concomitant advances in morpho-syntax (Fenson et al., 1994). Given this relationship, it seems reasonable that some of these children would experience a breakdown in linguistic production as they attempt to use the content and forms that they have not yet mastered. Further, it is during the processes of lexical retrieval and phonological and syntactic encoding that a number of disruptions can occur. These disruptions may result in the retrieval of a closely related but incorrect lexical item, or the presence of a place-holding disfluency, such as "um," while a child attempts to retrieve a particular word.

Evidence supporting this interaction perspective can be found in the case study presented by Hall and Burgess (2000), which traced the fluency and language development of a typically developing preschool child during early semantic and syntactic acquisition. The authors argued that dysynchronous development of the lexicon and syntax, coupled with pragmatic factors (i.e., the child's need to monopolize the conversational floor), led to fluency breakdown. The breakdowns were interpreted as indicative of the use of strategies that appeared to serve linguistic functions while the child attempted to revise or repair linguistic errors, or to buy formulation time while not relinquishing her conversational turn. Although this child's fluency appeared to normalize in conjunction with greater language mastery, it may be possible that some children who are predisposed to stuttering may find the effects of dysynchronies in language skills, particularly between semantics and syntax during critical growth periods, too significant to overcome. Thus, the difficulties managing mismatches in language may lead to disruptions in fluency production, and because a youngster may have a predisposition to stuttering (see Felsenfeld, 1997; Yairi, Ambrose, & Cox, 1996, for reviews of genetics of stuttering), or a temperament that does not tolerate the dysynchronies or the disruptions (see Conture, 2001; Guitar, 1998 for discussion of temperament and stuttering), stuttering emerges and may become part of the child's speech production repertoire.

More recent work on the interaction between vocabulary, syntax, and disfluencies in typical children has been reported by Rispoli (2003) and Rispoli and Hadley (2001). Building on previous work examining the occurrence of speech errors and disfluencies in the speech of early language users (e.g., Jaeger, 1992; MacWhinney & Osser, 1977; Stemberger, 1989; Wijnen, 1990), Rispoli and Hadley argued that sentence production occurs incrementally, and as children begin to use more complex sentence structures, disruptions occur as a result of some "glitch" in the formulation of the sentence. The glitch could involve the retrieval of an incorrect lexical item or inaccurate phonological encoding, which either slows down or interrupts the forward sentence production.

Similar to Hall and Burgess (2000), Rispoli (2003) suggested that the types of disruptions children use in sentence production reflect the linguistic processes being used. That is, he identified two different types of sentence disruptions: *stalls* and *revisions*. According to the author,

stalls were “a variety of sentence disruptions that add[ed] no new phonological, lexical or grammatical material to a sentence” (p. 4), and revisions were defined as “changes children make in phonology, lexical choice or morpho-syntax” (p. 4). Further, revisions were seen as developmentally more mature than stalls because they are assumed to reflect self-monitoring and comprehension processes, as well as the evocation of possible alternative components in language formulation (Hall & Burgess, 2000; Rispoli, 2003).

In his study, Rispoli (2003) examined the presence and types of disruptions in the spontaneous language of 56 typically developing children between the ages of 1;10 and 4;0. In terms of the loci of stalls and revisions, the results indicated that stalls occurred earlier in the sentence, whereas revisions occurred later. This supported the author’s hypothesis that disruptions in the form of stalls reflected glitches early on in incremental sentence planning and were used more likely for “buying time” to select appropriate lexical items or grammatical structures. In contrast, a revision, occurring slightly later in the sentence, reflected a glitch that had occurred after sentence production had begun, and was used to correct a specific linguistic error.

The use of revisions significantly correlated with mean length of utterance (MLU), although Rispoli (2003) found the relationship between revision use and MLU to reflect more than length and complexity. That is, the rate of revision use, although still increasing, slowed down as MLU increased. This suggested that factors affecting the use of revisions likely included “a multiplicity of aspects of sentence output beyond the purely morpho-syntactic, such as lexical choice and choice of sentence frame or shift of intention, that increased with linguistic development” (Rispoli, 2003, p. 826). That is, in Rispoli’s study, the rate at which children used revisions could not be attributed solely to their producing longer or more complex sentences; rather, other factors, including word finding and pragmatic considerations, influenced the frequency of revision use.

The significance of these findings for understanding the relationship of lexical development and stuttering in children rests with the interactive nature of sentence planning and speech disruptions. Although the contribution of syntactic length and complexity to stuttering has been documented consistently (see Bernstein Ratner, 1997, for review), Rispoli (2003) pointed out that sentence production includes linguistic encoding at multiple levels, any one of which may experience a glitch, resulting in some type of speech disruption. It is possible that for CWS, glitches in the processes of sentence production, including lexical retrieval, may play a role in the onset and development of stuttering by providing opportunities for a speech and language production system, rendered vulnerable by genetic and/or temperament factors, to experience breakdown, thereby necessitating repair. It is the combination of a vulnerable speech production system and sensitivity to breakdown in CWS that sets the stage for overreactivity to glitches and subsequent tension in their attempts to repair the glitches.

RELATIONSHIP BETWEEN LEXICAL DEVELOPMENT AND DISFLUENCIES

Typically, lexical development and the presence of disfluencies have not been linked in the same ways as have syntax and disfluencies. Despite the apparent disconnect between semantics and disfluencies, it has been suggested that a possible connection exists between dramatic increases in vocabulary (sometimes termed a “vocabulary burst,” e.g., Bloom, 1973; Dromi, 1987; Nelson, 1973) and the emergence of disfluencies. For example, there has been some speculation about the appearance of a second “vocabulary burst” around the second birthday (the first one occurring just before the attainment of 50 words), which possibly coincides with rapid expansion of both vocabulary and grammar, making for a substantial increase in the complexity of the language-learning task (Bernstein Ratner, 1997). In addition, children in the process of acquiring new words may find their lexical development outpacing their grammatical development, creating dysynchronies in language production. These mismatches between lexical skills and syntactic skills may provide opportunities for “glitches” in sentence planning as a child may be slow in generating a sentence frame within which to slot lexical items. An alternative possibility is that a glitch or disruption opportunity arises as a result of the retrieval of incorrect lexical items because of, as McGregor et al. (2002) argued, a fragile semantic representation, meaning the child has an incomplete conceptualization of the word and probably has not been exposed to or used the word frequently.

Consistent with this argument are the results of studies involving children with language impairment. Hall, Yamashita, and Aram (1993) reported that among a group of 60 preschool children who had been identified with language disorders, 10 demonstrated significantly more disfluencies than the rest of the group. When language profiles of the two groups were compared, the highly disfluent group exhibited substantial discrepancies between lexical and syntactic skills. It was suggested that the increased disfluencies resulted from the children’s difficulties integrating their relatively large vocabularies with their impoverished syntax for sentence production.

In turn, these findings were recently corroborated in school-age children in a study by Boscolo, Ratner, and Rescorla (2002). In this study, comparisons between 22 pairs of 9-year-old children with and without a history of expressive specific language impairment (HSLI-E) yielded significantly more disfluencies, including stuttering-like disfluencies, in the children with HSLI-E. What is particularly interesting about this investigation is that the children with HSLI-E were not considered to present clinical language disorders at the time of the study despite the fact that their scores on all language measures at age 9 were reduced as compared to the typical group. These reduced scores may have reflected subtle difficulties in language tasks, which ultimately may have been manifested as fluency breakdown. The interpretation given by Boscolo et al. was that children for whom language learning has been difficult are likely to be at risk for fluency breakdown during certain production

tasks that may burden the linguistic system. The authors were careful to point out that, despite the fact that the children with HSLI-E exhibited a substantial number of stuttering-like disfluencies, they did not demonstrate the struggle behavior that is often associated with stuttering. In addition, it is important to remind the reader that these studies have been presented as a way of illustrating the possible effects of language dysynchronies on fluency, and are not meant to suggest that CWS are necessarily language impaired.

This review of the literature on vocabulary development in typical children and children with language impairment provides evidence that linguistic development can be linked to the fluency of speech production. Although not likely in the early stages of vocabulary acquisition, lexical development may be central to observed changes in fluency when expansion of the lexicon is paired with rapid growth in syntax. For children who are struggling with simultaneously acquiring these components and integrating them, fluency may be sacrificed, at times, in the interest of communication.

LEXICAL SKILLS IN CWS

Studies directly investigating the semantic abilities of CWS have included general evaluations of language skills, lexical retrieval, the lexical loci of stuttered events, or spontaneous language analyses. Many of these studies have involved the investigation of multiple aspects of language, and thus it is difficult to isolate semantic effects from syntactic or phonologic effects. However, presented here is a description of the major research findings relative to semantic development and stuttering.

Standardized Evaluations of Lexical Skills

Initial studies of the language abilities of CWS reported diminished language scores as compared to those of children who do not stutter (CWNS; Byrd & Cooper, 1989; Murray & Reed, 1977). For example, in their investigation of preschool children, Murray and Reed reported that CWS scored significantly lower than CWNS on tests of language, including the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1959). Additionally, Byrd and Cooper found that CWS, ages 5 to 9 years, scored significantly more poorly on expressive language measures than on receptive measures. These authors argued that the lower expressive scores reflected the children's attempts to simplify verbal output as a strategy for coping with stuttering. Another way of interpreting Byrd and Cooper's data might be to suggest that the dysynchronies between the expressive and receptive skills provided the opportunity for fluency disruptions.

Despite the earlier findings (e.g., Byrd & Cooper, 1989; Murray & Reed, 1977), a 1990 critical review of the literature by Nippold found little support for any substantive differences on language task performance between CWS and CWNS. Nippold examined the literature on language onset, articulation, syntax, morphology, semantics, and word finding in individuals who stutter. In terms of

semantic skills, most studies examined school-age children, and although some found evidence for lower scores for the CWS as a group (e.g., Murray & Reed, 1977; Westby, 1974), the vast majority of their scores fell within the average range, and individual variation best characterized the nature of the results.

Findings from studies conducted since Nippold's review are less consistent with her summary, with some reporting no differences and others reporting significant differences on language measures comparing CWS and CWNS. For example, Ryan (1992) compared the language abilities of preschool CWS to those of preschool CWNS, examining their semantic/lexical abilities using standardized measures, including the revised PPVT (PPVT-R; Dunn & Dunn, 1981) and the Picture Vocabulary and Oral Vocabulary subtests of the Test of Language Development-Primary (TOLD-P; Newcomer & Hammill, 1982). The CWS scored lower than the CWNS on all measures of vocabulary; however, the scores achieved were within normative expectations for the children's ages. In addition, Yairi, Ambrose, Paden, and Throneburg (1996) found that although preschool children with persistent stuttering performed less well than a comparative group of preschool children who had recovered from stuttering, they did score well within the average range on all language measures.

Exceptions to the preceding trend can be found in recent studies comparing preschool CWNS and CWS (Anderson & Conture, 2000; Ratner & Silverman, 2000; Silverman & Ratner, 2002). Anderson and Conture administered the Test of Early Language Development-2 (TELD-2; Hresko, Reid, & Hammill, 1991) and the Peabody Picture Vocabulary Test-III (PPVT-III; Dunn & Dunn, 1997), along with other measures, to two groups of 20 preschool children matched for gender and age. Results indicated significant differences between the groups on both standardized language measures, with the CWS scoring significantly lower than the CWNS. In addition, the CWS demonstrated a larger gap between their scores on each measure (with the TELD-2 score higher than the PPVT-III score) than did the CWNS. The authors interpreted these findings as indicative of "an imbalance among components or aspects of the speech-language systems of CWS, a difference that might be sufficient enough to temporarily disrupt ongoing speech-language production, resulting in disruptions in the forward flow of speech-language production (e.g., stuttering)" (Anderson & Conture, p. 295). They noted that, although their findings differed from those obtained from children with developmental language impairment, that is, better syntactic abilities than lexical skills (cf. Hall et al., 1993), it simply may be the presence of a discrepancy among linguistic abilities (rather than specific skills being more advanced than others) that leads to fluency breakdown.

In a study exploring parents' perceptions of the communicative development of their CWS, Ratner and Silverman (2000) administered lexical measures to 15 preschool CWS and 15 preschool CWNS matched for age, sex, and socioeconomic status (SES). Comparisons revealed that, despite performing within the normal range, the CWS scored significantly lower than the typical children on the Expressive One-Word Picture Vocabulary Test-Revised

(EOWPVT-R; Gardner, 1985) and the Linguistic Concepts subtest of the Clinical Evaluation of Language Fundamentals–Preschool (CELF-P; Wiig, Secord, & Semel, 1992), but not on the PPVT-R (Dunn & Dunn, 1981). Results also indicated that the CWS used significantly fewer rare words during spontaneous language, as determined by a measure of lexical rarity (Beals & Tabors, 1995). Parents' ratings of their CWS on the MacArthur Communicative Development Inventory (CDI; Fenson et al., 1993), which primarily focuses on parents' identification of their children's expressive lexicon, were significantly lower than those of the parents of the CWNS. The authors noted that, although an exploration of language in CWS was not the intent of their study, in their small sample, the CWS consistently performed less well than their matched counterparts, suggesting less linguistic capability. Further, the authors surmised that "it is plausible, at first blush, that these children could more easily encounter communicative demands exceeding their ability to generate fluent speech" (Ratner & Silverman, 2000, p. 1259).

Lexical Retrieval Skills

Lexical retrieval in CWS has received little attention, although this area has been investigated somewhat in adults who stutter (e.g., Bosshardt, 1993; Watson et al., 1991). Of course, the examination of word retrieval in CWS is complicated by a variety of factors, including the familiarity of the lexical item (see Hubbard & Prins, 1994), the presence or absence of stuttering, and general reaction time. One study comparing CWS and CWNS found no support for extended word retrieval times in CWS (Boysen & Cullinan, 1971). The authors, however, did suggest a possible interaction between word familiarity, word length, and response time for CWS, such that the effects of longer, less familiar words impact word retrieval differently in CWS than in CWNS or even in adults who stutter. Other studies of word finding in CWS have identified delayed response times, although these investigations did not control for the possible role word fears or stuttering behavior itself may have played (Telser, 1971; Weuffen, 1961).

Lexical Category and Loci of Stuttered Words

Some of the most consistent findings on semantics and stuttering are those of the lexical category and loci of stuttered words (e.g., Au-Yeung & Howell, 1998; Bernstein Ratner, 1997; Bloodstein, 1995). In contrast to findings on adults who stutter, CWS typically stutter on function words more often than on content words (e.g., Bloodstein & Gantwerk, 1967; Bloodstein & Grossman, 1981; Howell, Au-Yeung, & Sackin, 1999). These results have been interpreted as the representation of syntactic effects rather than semantic (Bernstein, 1981). That is, in the language of young CWS, stuttering typically occurs at clause boundaries, which are more likely to contain function words such as articles (e.g., "a," "the,") or conjunctions (e.g., "and," "but,") than content words (e.g., nouns, verbs).

In their work on the developmental change in the lexical category and loci of stuttered words, Howell et al.

(1999) suggested that the strategies used in sentence planning also differ between fluent speakers and persons who stutter (PWS). By tracing the loci of disfluencies over development through a cross-sectional study, Howell et al. determined that fluent speakers exhibited a higher percentage of disfluencies on clause- or sentence-initial function words than on content words—a pattern that did not appear to change across age levels for fluent speakers. In contrast, the percentage of disfluencies for function versus content words for PWS changed from a higher percentage for function words in the youngest group (ages 2–6 years) to a higher percentage for content words in the older groups (ages 7–9, 10–12, 13–18, 20–40 years). The investigators interpreted their findings using a sentence planning orientation in which fluent speakers use disfluencies, such as repetitions of initial function words, as a "delaying strategy" for planning the remainder of the sentence (perhaps similar to Rispoli's stalls). Speakers who stutter, however, abandon the delaying strategy and use a strategy in which they continue on with sentence production even in the face of an incomplete or incorrect sentence plan. Howell et al. suggested that the transition away from use of the delaying strategy appeared to occur beyond age 12, arguing that "[c]hildren in this age range may be particularly vulnerable to advancing to content words because... the dysfluency rate on function words was not significantly higher than that on content words [for fluent children], unlike other age groups. If speakers abandon delaying repetition of function words, as the people who stutter into teenage and beyond do, they are likely to experience problems on the following content words" (p. 353). In other words, Howell and his colleagues argued that the processes of sentence planning do play a role in stuttering, such that PWS present difficulties managing content words in the sentence plan. When such words arise or are called for in the plan, but the plan is not completely available, PWS appear to use a strategy in which they attempt to produce the content word but are unable to move forward through it because of retrieval difficulties with either that word or the remainder of the sentence plan. This interpretation supports the hypothesis that lexical retrieval and the role of the lexicon in sentence planning is critical, if not at the onset of stuttering, certainly in the maintenance of the disorder.

Spontaneous Language Analyses

Most of the work thus far reviewed used experimental tasks or standardized tests to examine lexical or semantic abilities in CWS. Recent work by Watkins and her colleagues (Watkins & Yairi, 1997; Watkins, Yairi, & Ambrose, 1999) evaluated the productive language of CWS by analyzing spontaneous language samples. In a preliminary study comparing the spontaneous language measures of 12 CWS to 20 children who recovered from stuttering (10 "early recovered" within 18 months of onset; 10 "late recovered" within 18 to 36 months post onset), Watkins and Yairi found that, with the exception of one, the children with persistent stuttering demonstrated age-appropriate lexical skills as measured by the number of

different words produced (NDW) and the total number of words produced (NTW). The children who continued to stutter, however, did present greater individual variability than did the children in either of the other two groups. In contrast, the productive language scores of the early and late recovered groups were reported as above average, prompting the authors to speculate that these children, during the course of language acquisition, may “experience temporary trade-offs between language production and the generation of fluent speech, such that fluency is compromised in service of language formulation and production” (Watkins & Yairi, 1997, p. 396). That is, these children’s relative strengths within expressive language may tax their ability to maintain fluency simultaneously while producing connected language. This interpretation is consistent with anecdotal reports by parents of these children who are passing through a temporary phase of nonfluent production, in which the parents often remark that their children are thinking faster than they can speak.

In a more comprehensive study involving 84 preschool children, with 22 who continued to stutter and 62 who recovered, Watkins et al. (1999) analyzed spontaneous language samples using a variety of measures, including NDW and NTW. Findings indicated average or above-average scores on all measures for both persistent and recovered groups, although slight deviation from this was observed for some of the groups. For example, children in both the persistent and, in particular, recovered groups who entered the study at ages 2 to 3 years (the youngest group) exhibited advanced lexical, as well as other language, skills when compared to normative expectations. The children with persistent stuttering in the oldest group, who entered the study between 4 and 5 years of age, demonstrated less well-developed skills, although still within age expectations, relative to their same-aged peers who recovered. Although their findings do not provide evidence for linguistic deficits in CWS, Watkins and her colleagues speculated that advanced language during early development may set the stage for fluency breakdown because language behavior is not synchronous with other aspects of development. Therefore, as in the case of the youngest group studied, the stuttering may have been a manifestation of this dysynchrony. With continued acquisition and mastery of language elements, some children learned to manage output more fluently. In other cases, such imbalances in linguistic skills potentially provided particular challenges for children who may be predisposed to stuttering because of other factors, such as heredity or temperament.

The work of Ratner and her colleagues (Miles & Ratner, 2001; Ratner & Silverman, 2000; Silverman & Ratner, 2002) has examined parental linguistic input as well as parental perceptions of the language skills of their CWS, including vocabulary skill. Their findings have documented differences between typical children and CWS in the lexical characteristics of spontaneous language samples. For example, Silverman and Ratner investigated lexical diversity in CWS close to the onset of stuttering. Lexical diversity, in this case, referred to the children’s use of different words and their use of rare words in spontaneous language. In contrast to results presented by Watkins and

Yairi (1997), Silverman and Ratner found that their sample of CWS exhibited less lexical diversity than their matched peers, although their performance was not indicative of language impairment. The results of this study presented further evidence of reduced lexical proficiency, as the CWS performed less well than the CWNS on the EOWPVT-R (Gardner, 1985) and a measure of lexical rarity (see also Miles & Ratner, 2001; Ratner & Silverman, 2000). Given these findings, the investigators suggested that weak lexical skills, including subtle difficulties with the speed and accuracy of word retrieval or possible deficits in word storage, may be significant factors contributing to the onset and development of stuttering. The authors drew on the work of Anderson and Conture (2000), as well, to strengthen the argument that lexical development may play a role in the onset of stuttering, and that continued efforts toward understanding the interactions among linguistic components and fluency of speech production are warranted.

LINGUISTIC “TRADE-OFFS” AND STUTTERING

The central theme to emerge from this review of lexical skills in CWS is that of the potential contribution of mismatches between language skills toward the onset and development of stuttering. Although it does not appear that all CWS exhibit obvious delays in lexical and semantic development, some evidence has surfaced recently suggesting that some of these children may experience a mismatch in which lexical skills are outpaced by morphosyntactic abilities (e.g., Anderson & Conture, 2000), or that facility with the lexicon is reduced in these children (e.g., Miles & Ratner, 2001; Ratner & Silverman, 2000; Silverman & Ratner, 2002). According to Anderson and Conture, this mismatch suggests that “young CWS are somewhat delayed in storing lexical items, a delay that may make it difficult to quickly and correctly place such items in a syntactic frame” (p. 297).

Other research has suggested a slightly different trend in which relatively advanced language skills, including semantic skills, early on in development may play a role in the onset of stuttering behavior, although it is unclear what role such skills play in either the recovery from or persistence of stuttering (e.g., Watkins et al., 1999). A different possible mismatch was identified by Watkins et al. when they compared their findings to those of Paden, Yairi, and Ambrose (1999). In the Paden et al. study, preschool CWS demonstrated less well-developed phonological skills than those of age-matched, typical children. In discussing their findings relative to those of Paden et al., Watkins et al. suggested that a mismatch between advanced morphosyntactic and lexical skills and “less sophisticated phonological skills” (p. 1134) may contribute to stuttering.

Finally, the work of Ratner and colleagues underscored the importance of examining the child’s lexicon at the onset of stuttering. As noted by Silverman and Ratner (2002):

The power of such lexical analyses to shed light on the underlying nature of stuttering would be heightened by continued emphasis on studying children very near the onset of stuttering symptoms. If lexical patterns observed at stuttering onset can be firmly related to the presenting symptoms of children who stutter, work to strengthen lexical access skills in young children could become an important component of early intervention. (p. 300)

The contribution of continued work on the lexical skills of CWS will help to expand our understanding of the profile of language abilities presented by CWS at the time of stuttering onset. By profiling these youngsters' language skills, the role of linguistic mismatches, as well as the contribution of individual linguistic skills, to the onset and development of stuttering can be determined. Equipped with this knowledge, clinicians will be better prepared to address the needs of CWS.

IMPLICATIONS FOR CLINICAL PRACTICE

This review of semantic abilities serves as a reminder that the language acquisition process involves the complicated tasks of integrating semantic and lexical elements with morphologic, syntactic, and phonologic components within a pragmatic context. Thus, when working with CWS, it is vital to attend to the linguistic context in which these youngsters are taught to manage their speech. This includes not only taking care to control for language level, but also addressing a child's profile of language abilities, especially the presence of linguistic mismatches. Given that most clinicians have considerable experience with language intervention, these recommendations will likely ring true. The following discussion of the clinical implications of the research on lexical skills in CWS will address both assessment and intervention considerations.

Assessment Considerations

The research on semantics and stuttering has indicated that, as a group, CWS do not demonstrate deficits in lexical abilities, although the possibility of reduced capacity and greater variability in such skills may be characteristic of some children in this group. In terms of addressing the clinical needs of these children, the research supports an approach whereby measurement of the lexicon is conducted both consistently and longitudinally. Given that trade-offs between certain linguistic abilities and fluency may be key relative to understanding the onset and development of stuttering, tracking lexical development in conjunction with other language skills and fluency may be critical. The clinician can monitor changes in vocabulary skills relative to other aspects of language and document the effects of changes on fluency. Recommended approaches to measuring lexical skills include determining the parents' knowledge of their children's vocabularies through the use of an instrument, such as the Language Development Survey (LDS; Rescorla, 1989) or the CDI (Fenson et al., 1994); administering standard vocabulary tests; or tracking lexical use in spontaneous language samples. Computerized programs for

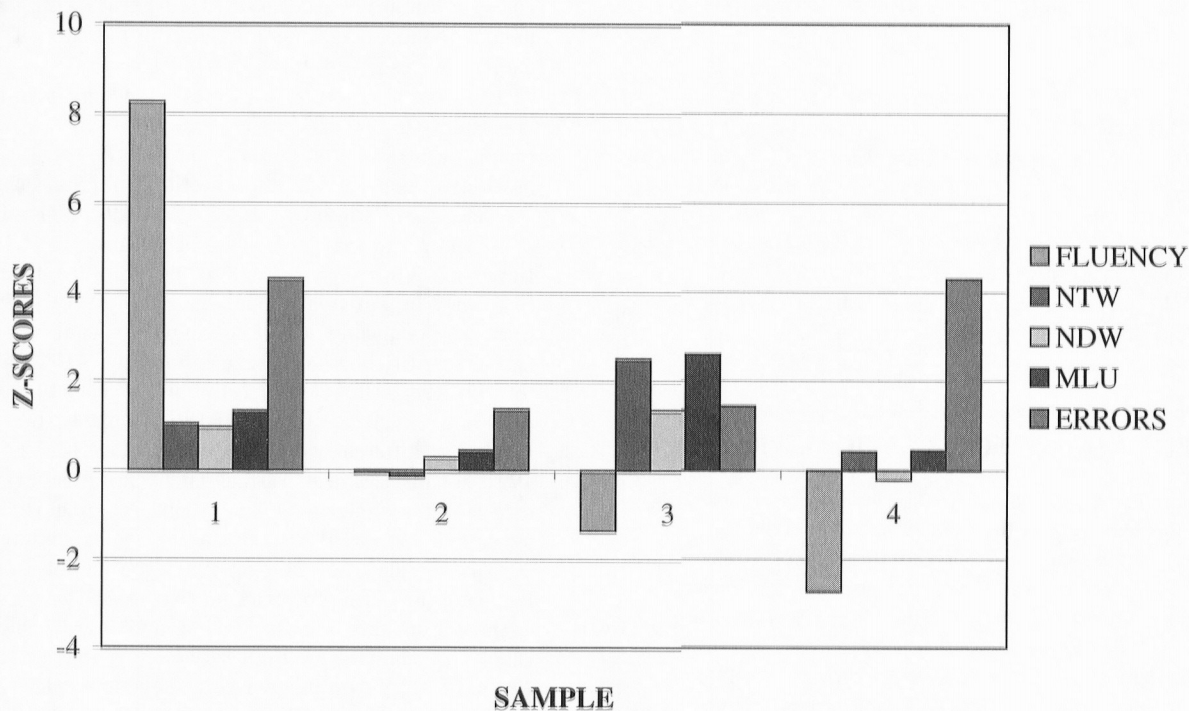
language sample analysis, such as the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1996) and the Child Language Data Exchange System (CHILDES; MacWhinney, 2000a, 2000b), provide opportunities for analyzing multiple aspects of language, tracking developmental changes longitudinally, and, in the case of SALT, comparing results to normative databases.

By using a variety of measures, clinicians have the opportunity to compare lexical measures with syntactic and pragmatic measures in terms of profiling a youngster's productive language and then overlay stuttering behavior on the language profile (see Miller, 1981, 1991, for a discussion of profiling language skills in general; also see Hall & Burgess, 2000, for an example of profiling language relative to fluency in particular). When measuring lexical development in spontaneous language samples, vocabulary productivity and richness can be measured by NTW and NDW, respectively. In the case of NTW, the total number of words used in a sample are tallied, and to calculate NDW, the number of different words are counted (see Miller, 1981, 1991, for discussion of various language measures). These data help the clinician to learn about how linguistic elements are interacting and their potential effects on stuttering.

An example of overlaying fluency behavior on a language profile is presented in Figure 1. These data, adapted from the case study of "Lucy" in Hall and Burgess (2000), document how Lucy's fluency changed over time (from ages 2;9 to 3;9) relative to developmental changes in her language. The figure graphically represents *z* scores of the percentage of total disfluencies, lexical measures of NTW and NDW, and morphosyntactic measures of MLU and the number of grammatical errors. Because *z* scores represent the number of standard deviations away from the mean a score falls, with zero indicating the mean, positive *z* scores reflect increased performance relative to the mean, whereas negative *z* scores reflect reduced performance. Lucy's *z* scores were calculated using normative data from Yairi (1997) for fluency and the SALT database (Miller, 1993) for the language measures.

In the first measurement (marked as Sample 1 on the figure), Lucy (age 2;9) exhibited substantially increased disfluencies at the same time that her language, in terms of word use and MLU, appeared as advanced for her age. Additionally, Lucy demonstrated many more grammatical errors than expected for her age in spite of the fact that both her lexical use (as measured by NTW and NDW) and her syntax (as measured by MLU) appeared to be well developed. These mismatches in Lucy's language may have provided the context for instability in speech and language production, which was manifested as increased disfluencies. Over time, as Lucy's linguistic development appeared to stabilize, so did her fluency. This is observed by the narrowing of the gap among measures for Samples 2 (age 3;1) and 3 (age 3;4). Interestingly, Lucy appeared to enter another period of linguistic instability in Sample 4 (age 3;9), as evidenced by a significant increase in grammatical errors; yet, her percentage of disfluencies continued to decrease. Perhaps stability of Lucy's fluency was achieved during the time in which her language use more closely matched her developmental stage (e.g., Samples 2 and 3),

Figure 1. Comparison of z scores of total disfluencies (FLUENCY), total number of words (NTW), total number of different words (NDW), mean length of utterances (MLU), and total number of grammatical errors (ERRORS) in Lucy's speech and language across four samples at ages 2;9 (years;months), 3;1, 3;4, and 3;9.



and, as such, was less vulnerable to potential impacts from a stressed linguistic system (i.e., one in which linguistic mismatches exist) as when she exhibited grammatical errors in Sample 4.

It is important for clinicians to use a variety of techniques for evaluating lexical skills because the use of each technique alone provides only limited information. Parent checklist instruments may not be appropriate for some children because their vocabularies are too large to measure in this way (i.e., school-age children), vocabulary tests are only global measures, and spontaneous language samples, without the inclusion of elicitation tasks or more complex language tasks, may reveal only the language a child is comfortable using (and not represent the words a child knows but rarely uses). In addition to a parent instrument, clinicians may want to obtain information from classroom teachers, particularly if word finding difficulties are suspected to impact the stuttering. Teachers may also be able to provide insight into the level of lexical richness in a youngster's everyday language at school. This information is valuable to a clinician attempting to determine the effects of stuttering on a child's language use and communicative effectiveness. Several checklists examining multiple aspects of communication (e.g., discourse as well as syntax or vocabulary) exist for clinicians to use with teachers (e.g., Catts, 1997; Ripich & Spinelli, 1985). Thus, for school-age children, clinicians will want to take advantage of teacher-oriented checklists as most of the checklists for parents typically address the needs of younger children.

Spontaneous language samples may provide the best opportunity for observing the interactions among linguistic skills and stuttering. As stated earlier, however, without the inclusion of certain elicitation tasks, clinicians may see only what a child may be most comfortable producing. It is recommended that tasks involving the use of richer and more complex language be included in a sampling to gain more information on the extent of a child's semantic/lexical system and how the use of that system impacts stuttering. For school-age children, these tasks might include an interview format, which has been shown to elicit more advanced language than free play (see Evans & Craig, 1992), or a narrative task (see Hadley, 1998), which is more effective with adolescents. These samples can then be analyzed for lexical richness by using, in addition to NTW and NDW, a measure such as the one described by Paul, Hernandez, Taylor, and Johnson (1996), in which the vocabulary of the sample is compared to a list of common children's words (Wepman & Hass, 1969). Any analysis such as this one will allow the clinician to determine whether the child is using simpler vocabulary during spontaneous expressive language tasks than during structured elicitation tasks.

Overall, a clinician examining interactions between language and stuttering will need to investigate the semantic component thoroughly. A combination of parent and/or teacher impressions, standardized lexical measures including receptive and expressive vocabulary and word finding (e.g., Test of Adolescent/Adult Word Finding,

German, 1990; Test of Word Finding in Discourse, German, 1991), and spontaneous language tasks will provide valuable information on how semantics and stuttering interact. This thorough assessment can also serve as the foundation on which to build an intervention program.

Intervention Considerations

Once a clinician has assessed semantics, fluency, and the potential interaction of the two, he or she must determine whether the child is sacrificing language by using a reduced lexicon to assist fluency or sacrificing fluency in the interest of appropriate or advanced lexical use. Although it is understood from the literature that not all CWS exhibit frank lexical impairments as a group, they may have less well-developed lexical skills than typical peers or mismatches in aspects of linguistic development. These subtle differences may lead CWS to experience difficulties manipulating particular linguistic elements at the same time they are attempting to maintain fluency. Depending on the nature of the interaction between fluency and semantics, a clinician can first address stuttering in the context of a controlled lexicon, that is, a closed set of known words or semantic concepts, or incorporate activities directly addressing lexical retrieval or semantic concepts into fluency treatment. Thus, when teaching a youngster strategies for producing fluent speech, the clinician should first use vocabulary that is familiar to the child. This technique, a well-established and familiar maxim in language intervention (e.g., Fey, 1986), helps reduce the linguistic and sentence planning demands on the child while learning new speaking skills.

MANAGING SEMANTICS WHEN ADDRESSING STUTTERING

For the youngster whose lexical/semantic development appears stable, or one whose stuttering is greatly impacted by sentence planning and lexical retrieval, the clinician can engage in direct stuttering treatment within a controlled linguistic context. In particular, establishing the lexical/semantic level at which a child can maintain fluency or manage stuttering is important. Similar to the principles of Costello's (1983) extended length of utterance (ELU) and Ryan's (1974) gradual increase in length and complexity (GILCU) treatment programs, clinicians can develop a hierarchy of lexical items and semantic concepts by comparing the semantic characteristics of a child's fluent utterances to those of the stuttered utterances. Techniques for establishing fluency or managing stuttering would be taught first in those semantic contexts in which the child already experiences some fluency. Just as a clinician would provide "scaffolding" and support (see Nelson, 1998; Paul, 2001) in language intervention, the same principles can be used when working to establish fluency in a CWS. With improvements in fluency, the clinician can gradually expand or increase the semantic complexity by adding richer lexical items or requiring more sophisticated descriptions or narratives.

A CASE EXAMPLE: "BRADLEY"

This type of treatment was used with "Bradley," a 6-year-old with a mild-to-moderate stutter. Bradley exhibited well-developed language skills, enjoyed talking, and frequently shared lengthy descriptions of events and experiences. Early on in working with Bradley, it became clear that his attempts at complex descriptions with sophisticated vocabulary (e.g., detailing the distinguishing marks of different types of sharks, their habitats) interfered with his ability to maintain fluency (see the Appendix for an example language transcript showing language-fluency interactions). The author determined a hierarchy of linguistic tasks, accounting for lexical demands as well as syntactic demands, to teach Bradley fundamental fluency-shaping skills. The hierarchy included activities beginning with simple picture description, where the child was asked to provide information that answered basic *wh*- questions (e.g., Who do you see?, What are they doing?, Where are they?). Next, Bradley was asked to provide verbal directions in a barrier game. Ultimately, spontaneous descriptions and narratives were solicited. Care was taken to control for vocabulary by establishing a set of words for each task agreed on by the clinician and child. Once mastery was achieved using the selected vocabulary, the activities were modified to allow the child to perform them spontaneously. Bradley moved in and out of the various hierarchy levels as he continued to learn to use his fluency techniques, sometimes requiring a return to a less demanding level for practice. Inclusion of family members in therapy facilitated the transfer of Bradley's skills to the home setting as the family was able to engage in many of the same activities used in treatment. Transfer of skills to school was facilitated by including the clinician in activities in the classroom, providing support for Bradley in the lunchroom, and incorporating important classroom vocabulary into therapy activities.

MANAGING FLUENCY WHEN ADDRESSING SEMANTICS

It is not uncommon for clinicians to find themselves working with CWS whose language systems may be vulnerable or may involve linguistic mismatches that interfere with the production of fluent speech. For these youngsters, clinicians may need to include direct work on language competencies as well as the stuttering behaviors. In addressing semantic skills, clinicians would do well to incorporate strategies for word retrieval into fluency-shaping or stuttering-modification activities. One of the best places to start improving a child's lexical and semantic stability is to strengthen his or her word knowledge and provide expanded exposure to vocabulary. Blanchowicz (1986) described a program of lexical improvement that involved five steps: (a) activate what the child already knows, (b) help the child to make connections among words and topics, (c) use both spoken and written modalities where appropriate, (d) refine and reformulate word meanings, and (e) use the target words for writing and additional readings. The value of a program

such as this lies in enhanced exposure to vocabulary and increased opportunities for practice because it can be applied anywhere and because it dovetails nicely with classroom activities.

A second component of word finding intervention incorporates what Wallach and Miller (1988) identified as "visual maps" to increase semantic associations among words and topics (see also Yoshinaga-Itano & Downey, 1986). A visual map for a younger child might revolve around a classroom theme and would involve illustrating certain concepts, identifying the vocabulary associated with the concepts, and representing the connections among the vocabulary words. For older students, the use of semantic webs in which ideas (and vocabulary) for narratives are generated by the student before the actual story is constructed can be used to reinforce and strengthen lexical storage and retrieval. Readers interested in learning more about methods for addressing semantic and lexical retrieval deficits in children are directed to Nelson (1998) and Paul (2001). Both sources provide more detailed descriptions of lexical- and semantic-based activities. Finally, clinicians can draw on their language intervention knowledge and experience and make note of the interaction between the lexicon and syntax and discourse or pragmatic factors both in treatment activities and in preparing a child to use new skills in transfer and generalization.

ANOTHER CASE EXAMPLE: "FRED"

"Fred," a child who stuttered, frequently used nondescript, generic terms (e.g., "things," "stuff," "those,") in conversation, probably as a way to avoid stuttering. This had the effect of simplifying his syntax and contributing very little to the discourse. To address his stuttering at the same time as his language competencies, therapy first focused on teaching basic techniques for fluency and stuttering management, and then assisted word retrieval, lexical richness, and language formulation. Expansion and retrieval of lexical items involved the use of semantic webbing and picture, event, and concept description tasks. These activities started with picture description, in which the vocabulary was controlled, and moved to narrative tasks, in which a semantic web, involving concepts and vocabulary from the classroom, was first drawn on a large piece of newsprint. Fred identified ideas, vocabulary, and components of the narrative that were written out on the newsprint and then practiced their productions. With the support of having rehearsed both the vocabulary and the structure, Fred's success with the narrative tasks themselves was greatly improved, and he also was better able to manage fluency.

Once Fred was able to engage in these tasks with success in both fluency and language, discourse and pragmatic concepts were introduced to increase the difficulty of the task and to facilitate transfer of skills. Fred learned about his responsibilities in a conversation and the need to be unambiguous in his communication. For example, Fred learned to make sure his descriptions included specific vocabulary and, when listening to others, he was encouraged to ask questions when clarification was

needed. Finally, the separate elements of fluency and language were put together in an activity in which Fred "interviewed" unfamiliar persons about their opinions on particular topics. For this task, Fred identified his primary goal as "effective communication," meaning his contributions to the interview would be clear in terms of language use and his stuttering would be managed through technique use so as not to interfere with the communication. Thus, he integrated his fluency-shaping and speech management techniques with using appropriate and specific vocabulary and syntax while explaining the activity to his listener. The task required Fred to clarify what was expected of the "interviewee," providing him with the opportunity to practice appropriate discourse and pragmatic skills (specifically knowing how much he needed to inform his listener about the topic and how to guide the interview) while formulating language and using his speech techniques.

CONCLUSION

This article addressed how the literature on lexical and semantic development may contribute to our understanding and treatment of stuttering in children. To date, the area of semantic skills in CWS has received limited attention in the research arena as compared to other aspects of language; however, this does not mean that semantics is unimportant. Rather, because semantics and the lexicon are significant components in language acquisition and formulation, they should be taken into consideration when assessing and treating CWS. As the case studies illustrated, these aspects of language are best examined and addressed in the larger linguistic context by profiling language skills relative to stuttering behavior. Subtle differences in language skills, or mismatches between lexical abilities and other aspects of linguistic development, may set the stage for breakdowns in fluency in youngsters who are predisposed to stuttering. Further, some CWS exhibit difficulties manipulating language at the same time they are attempting to manage fluency. As documented by past research, CWS exhibit vulnerable language abilities, and when faced with trying to manage stuttering or produce fluent speech, their language performance suffers. Clinicians need to draw on their experience and strengths in language intervention techniques to assist these children in the tasks of language formulation and fluency maintenance. Initially, fluency treatment may be conducted in the context of reduced linguistic demands in order for the CWS to experience fluency. Yet, clinicians should follow up this initial work with language-based intervention, focusing on stabilizing fluency skills in the context of ever-expanding language. Effective intervention with a CWS accounts for and addresses the interaction between fluency and language.

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APPENDIX. SPONTANEOUS LANGUAGE TRANSCRIPT: "BRADLEY"

- B: (And [PWREP]) And I saw the (s... [PRO]) sandtiger shark and the tiger shark.
B: And there was a great white ([TP] in that book, but it was huge!
B: (It was like kinda....from...um...um...It was like....tan...well...ss...well...um...It's like fin would be like...I mean [REV]) It's tooth would be (about [REV]) maybe big as this.
E: Sounds like it was big!
B: (An And [PWREP]) And it was dead though (be...[PWREP]) because they (c [PWREP]) caught it.
B: (And...And...And... [PWREP]) And when we went (t [PWREP]) to (um [INTJ]) this (m [PWREP]) museum in Boston, this museum, I saw a huge sea turtle.
E: That must have been fun.
B: (I [PWREP]) I saw this (m [PWREP]) movie, it's called (Na [PRO]) National (G [PWREP]) Geographic of sharks.
B: I saw a (r [PWREP]) real great white (sh...[PRO]) shark.
B: (Th Th Th [PWREP]) They said (sh...[PRO]) sharks don't eat people (c c c [PWREP]) cause they think they're (g g [PWREP]) gonna (ki ki [PWREP]) kill them, they just eat (c c c [PWREP]) cause they (th [PWREP]) think they're a meal.

Note. Disfluencies are enclosed in parentheses, ... = pause, PWREP = part-word and monosyllabic word repetitions, PRO = prolongation, REV = revision