In the United States (U.S. Bureau of the Census, 2003), there is a growing prevalence of bilingual speakers, that is, individuals who use two or more languages in their everyday activities (Grosjean, 1989). Speech-language pathologists (SLPs) can therefore expect referrals for an increasing number of bilingual clients who demonstrate a variety of acquired cognitive and communicative disorders, including aphasia. For instance, approximately 45,000 new bilingual aphasia cases are expected per annum in the United States (Paradis, 2001). With this inevitable increase in our bilingual caseloads comes the need to determine effective and efficient assessment and treatment protocols that take into consideration the unique needs and skills of bilingual versus monolingual clients. Accordingly, to increase awareness and understanding of the theoretical and applied issues surrounding service provision to bilingual clients, this article reviews the existing research by discussing (a) the potential bilingual client population in the United States, (b) definitions of bilingualism, (c) neurolinguistic and psycholinguistic views of bilingualism in adults with and without aphasia, (d) bilingual aphasia recovery patterns and the factors that might influence these recovery patterns, and (e) diagnostic and therapy procedures for addressing the cognitive and communicative needs of bilingual clients with aphasia.

Conclusions: Despite a growing understanding of bilingualism and the various recovery patterns identified with bilingual aphasia, there remains a dire need for empirically validated management techniques, particularly in terms of determining which language to target, identifying which aspects of various languages are most vulnerable to insult as well as most responsive to treatment, and establishing how to exploit language similarities to maximize treatment efficiency.

Key Words: aphasia, bilingual, recovery, assessment, treatment

The Bilingual Client Population

Demographics

Census data indicate that individuals who speak more than one language represent one of the fastest growing segments of the U.S. population. For example, on the 2000 U.S. census, 47 million individuals 5 years of age and older spoke a language other than English at home (most frequently Spanish followed by Chinese and French), representing a 14% increase since 1990. Of the 28 million who speak Spanish as their primary language, roughly 50% and 90% reported speaking English “very well” or with no difficulty, respectively, making the majority of this population bilingual. Along with this growth, there are increasing numbers of elderly individuals. For example, the elderly Hispanic population is the fastest growing subgroup in the United States (American Speech-Language-Hearing Association [ASHA], 1991). Rising numbers of elderly individuals are important because of the increased risks of acquiring cognitive-communicative disorders, including aphasia, associated with aging.

Whereas to many SLPs it may seem remote to have bilingual clients on their caseload, Laganaro and Overton Venet (2001) pointed out that bilingual speakers are already common in large urban outpatient settings, and all U.S. regions have experienced dramatic increases in the population who...
Health Factors

SLPs working with the aphasia population need to be aware of the risk factors for conditions that cause aphasia not only to provide appropriate client and family counseling and education but also, ideally, to educate the general public and facilitate prevention of aphasia and other neurogenic communication disorders. As Latinos are currently the largest minority in the United States (American Heart Association [AHA], 2005), health concerns particular to this community will be reviewed to exemplify the pressing need for establishing efficacious aphasia assessment and treatment protocols for bilingual clientele.

Risk factors for stroke, the primary cause of aphasia, include diabetes, smoking, obesity, high cholesterol, and sedentary lifestyle (AHA, 2005). Whereas current statistics indicate that Latino individuals age 18 years and older have slightly lower rates of heart disease, hypertension, and history of stroke compared with their non-Latino White peers, they are twice as likely to develop an ischemic stroke due to inactivity, obesity, and diabetes. Likewise, among Mexican Americans, the fastest growing Latino group in the United States, stroke incidence is slightly higher at 1.63% compared to 1.36% for their non-Latino White peers (Morgenstern et al., 2004); transient ischemic attacks at younger ages also are more frequent in this group of Latino individuals. Compounding this increased stroke risk in Latino adults is reduced access to appropriate health care services. In a study controlling for age, gender, income, education, insurance, and residence location, Latino individuals were 33% less likely to receive all necessary health care services compared with non-Hispanic White individuals (U.S. Department of Health and Human Services, 2004). Several factors may contribute to poor health care access, including a lack of health insurance, interpreters, and translators (Indiana Commission on Hispanic/Latino Affairs, 2005).

The implications for SLPs working with this population are many. They need to be prepared for clients who may not have received expected levels of care acutely or postacutely, or who may not have access to the full range of typical stroke care services. Significantly, SLPs may find themselves needing to advocate for client care, placing more effort into education, and taking on a larger than usual case management role. In summary, the above statistics highlight the rapidly growing bilingual population in the United States and further underscore that many of these individuals are at risk for developing medical conditions that can produce aphasia or other cognitive-communication disorders. Consequently, there is a growing need to ensure that SLPs are adequately prepared to serve the bilingual population. This includes understanding the nature of bilingualism and the theoretical models forwarded to explain bilingualism.

Defining Bilingualism

Debate persists on how best to quantify and qualify, and thus define, bilingualism (Baker, 1993; Grosjean, 1989; Menamara, 1969; Paradis & Libben, 1987). Of the various definitions, Grosjean (1989) characterized bilingual speakers in perhaps the most realistic terms as those who speak two or more languages in daily life. Perfect knowledge of both languages is not required; instead, people use different languages for different purposes or life domains and consequently have different levels of proficiency within their languages across those domains. For example, in the United States, many immigrants are communicatively competent in their second language (L2), English, for work purposes, but may have quite limited English proficiency in other life domains (e.g., church, home).

The terms early and late are often used to describe bilingual speakers’ language competency, with early bilingual speakers (i.e., those who acquire their languages prior to adolescence) being assumed to have greater proficiency in L2 than late bilingual speakers (i.e., those who acquire L2 after adolescence; Ardila, 1998). Whereas age, sequence, and method of acquisition offer some suggestion of proficiency, there remains great variation, even among speakers with similar acquisition histories. Other factors such as the language used in the school system, personal and social attitudes (e.g., cultural identification and “loyalty”), and family can affect use and maintenance of both the earlier language (L1) and the later learned L2, even if L1 is used at home (Ardila, 1998; Muñoz & Marquardt, 2003). Furthermore, cultural identity can vary geographically and across generations and socioeconomic levels, adding to variability.

In addition to varying uses of their respective languages, bilingual speakers may engage in a behavior known as code switching: alternating uses of one’s languages to add communicative intent, emphasis, or emotional value (Muñoz, Marquardt, & Copeland, 1999). Appropriate code switching requires linguistic competence in identifying and using languages appropriate to communicative interactions. Code-switching constraints include environmental, social, and personal factors, grammatical principles, and level of education. The acceptability of code switching also varies across communities: Frequent code switching is considered appropriate in some communities but uncommon and less accepted in others. For example, Fabbro (2001a) observed nominal code switching in Italian-Friulian speakers. Additionally, Muñoz et al. (1999) identified and described a number of switching patterns and found that both speakers with and without aphasia exhibited patterns of code switching typified as disordered; these data suggest substantial variability in what is “normal” across local speech communities. Accordingly, for various reasons, bilingual speakers can differ greatly in their respective uses of and proficiency in their languages. To understand further bilingualism, models used to explain the neurological, linguistic, and cognitive underpinnings of bilingualism are next reviewed.
Models of Bilingualism

Neurolinguistic Aspects of Bilingualism

Within the field of neurolinguistics, language is viewed as a modular construct in which each linguistic function depends on the involvement of several subcomponents (e.g., spoken output involves concept retrieval, lexical selection, syntactic organization, and oral-motor programming), and each of these subcomponents can be localized in different parts of the brain (see Fabbro, 1995; for a comprehensive review). With respect to bilingualism, neurolinguistic research has focused on determining where different languages are localized and whether all of a speaker’s languages are localized in similar or distinct areas of the brain.

Thus far, separate, shared, and amalgamated representations theories have been put forth to explain the neural organization of bilingual speakers’ languages. Whereas initially researchers hypothesized that languages resided separately in the brain, this view was replaced with one in which languages shared representation (Fabbro, 2001b). In the early, shared representation approach, all languages were hypothesized to rely upon the same cerebral areas (Fabbro, 1995); if this was the case, however, all languages should be equally damaged following an insult. Because a substantial empirical literature contradicts this predicted outcome and highlights heterogeneity in the recovery patterns of bilingual individuals with aphasia (e.g., Fabbro & Paradis, 1995; Paradis, Goldblum, & Abidi, 1982), researchers have proposed additional factors (e.g., quantity of input from the respective languages following injury, emotional experiences in the languages, language use after injury) that might contribute to differential L1/L2 recovery (Aglioti, Beltramello, Girardi, & Fabbro, 1996; Goral, Levy, Obler, & Cohen, 2006; Green, 2005; Minkowski, 1927/1983). Combining shared and separate representation views, the amalgamated hypothesis asserts that languages share some areas of the brain but also retain some separate neural areas. Although there are mixed findings in terms of both the cerebral (i.e., which hemisphere supports the language or languages) and intrahemispheric neural representations of language in bilingual speakers (i.e., which structures within a given hemisphere support the language or languages; Paradis, 2004), most research supports the amalgamated view. To illustrate, in most neuroimaging investigations, no laterality differences have been found between monolingual speakers and bilingual speakers (Hernandez, Dapretto, Mazziotta, & Bookheimer, 2001; Hernandez, Martinez, & Kohnert, 2000; Kim, Relkin, Lee, & Hirsch, 1997). Right hemisphere damage in bilingual speakers, consequently, will result in the same patterns of cognitive-communication deficits that monolingual speakers experience, and bilingual speakers who suffer left hemisphere damage are at risk for aphasia onset (Paradis, 2004).

Shared lateralization, however, does not imply an absolute overlap of languages or sharing of the exact same neuronal circuits. Whereas research suggests overlap of L1 and L2 (Hernandez et al., 2000, 2001; Kim et al., 1997; Perani et al., 1998), investigators continue to explore factors that influence the extent of this overlap. Age of language acquisition is one proposed factor. For example, functional magnetic resonance imaging (fMRI) studies of early Spanish-English bilingual speakers completing naming tasks found no activation differences between L1 and L2, indicating significant neural overlap (Hernandez et al., 2000, 2001). In contrast, Kim et al. (1997) found similar L1-L2 activation in some areas but different activation levels in others for late L2 learners engaged in silent sentence generation tasks, suggesting that age of acquisition plays a role in the pattern of intrahemispheric cerebral activation. Proficiency level, however, may have interacted with age of acquisition in the Kim et al. (1997) study and, in fact, is another proposed factor. For example, using listening comprehension tasks, Perani et al. (1998) found no differences in the activation patterns of early and late bilingual speakers when both groups demonstrated high proficiency in both languages. De Bleser et al. (2003) used positron emission tomography (PET) to examine activation patterns during a picture-naming task. The participants were native Flemish/Dutch speakers who had good proficiency in their L2, French. Although De Bleser et al. found minimal activation differences among naming of cognates in L2, cognates in L1, or L1 noncognates, they did observe a different activation pattern (i.e., left inferior frontal and tempo-parietal areas) when participants named L2 noncognates. They concluded that recruitment of additional neural areas was necessary when producing words in the less proficient language. Accordingly, one theory of second language acquisition, the convergence hypothesis, states that regardless of age of acquisition, as proficiency increases, so too will the level of neuroanatomical convergence (Green, 2005).

Language learning modality may also influence the neural mapping of bilingual speakers’ languages by evoking participation of different memory stores (Paradis, 2004; Ullman, 2001). Implicit memory, more commonly referred to as procedural memory, relates to automatic processes completed within nominal awareness, whereas explicit memory, also known as declarative memory, involves controlled processes carried out at the conscious level (Ullman, 2001). These two memory systems employ distinct cerebral regions: Procedural memory is primarily associated with left frontal and basal ganglia structures, whereas declarative memory is primarily associated with bilateral temporal lobes. Both types of memory have been implicated in language learning and use. Implicit memory appears key to L1 development, which occurs during childhood; explicit memory has been implicated in factual learning and the formal language learning that typically occurs during L2 acquisition. Automatic processing, however, is not limited to L1 or languages acquired during childhood. That is, with extensive L2 practice, speakers may develop implicit competence in which L2 can exploit procedural memory and speakers can use the L2 automatically, without explicitly recalling the rules that support accurate comprehension or production (Segalowitz, Segalowitz, & Wood, 1998). Nevertheless, languages learned through formal study (typically L2) may have wider cerebral representation and utilize declarative memory more than L1; in contrast, learning and using L1 more often exploits procedural memory and thus may have a more focal subcortical representation. As these two memory systems employ different cerebral pathways, one or the other may be selectively affected by
Psycholinguistic Views of Bilingualism

Psycholinguistic models of language processing attempt to explain steps or stages that contribute to language comprehension and production. For both monolingual and multilingual speakers, at least two levels of language representation have been forwarded: lexical and conceptual (Kroll & de Groot, 1997; Levelt, 1999). The lexical level includes information about word form and correct syntactic use, whereas the conceptual level includes information about word’s meaning in a real-world context. Various models have been proposed to account for how this system works within the framework of a bilingual language system.

One such model, as forwarded by Kirsner, Lalor, and Hird (1993), involves a single system in which all words related in form and meaning from both languages are stored together. In this view, the bilingual lexical system is organized similar to that of a monolingual system: Words in a bilingual speaker’s lexicon are organized according to morphology, not according to language. Therefore, for English-Italian speakers, words such as motivation and its Italian equivalent motivazione would be stored together, whereas words that share meaning but not morphology, such as cat and gatto, would be stored separately. Similarly, according to the Bilingual Interactive Activation model, words are interconnected, and lexical access is not language selective, as the lexicon has words from both languages (Dijkstra & van Heuven, 1998).

In contrast, several hierarchical models have been proposed that specify separate lexicons with a shared concept store (e.g., Kroll & Stewart, 1990, 1994; Potter, So, Von Eckardt, & Feldman, 1984). These models differ in terms of connections between lexical stores, conceptual links, or both. For example, within the Word Association Model, L2 words are accessed through L1 (Potter et al., 1984); thus, the L2 and L1 lexicons are linked, but only the L1 lexicon has direct access to concepts via a conceptual link. Conversely, the Concept Mediation Model allows each lexicon, L1 and L2, direct access to the conceptual store (i.e., two separate conceptual links) rather than a connection between the two lexicons. Both models have received empirical support, suggesting that under different lexical retrieval circumstances, a different model may apply. To illustrate, whereas data from picture naming (Caramazza & Brones, 1980; Dufour & Kroll, 1995; Potter et al., 1984) and priming tasks (Chen & Ng, 1989; de Groot & Nas, 1991) support the Concept Mediation Model for at least bilingual speakers who are proficient in both languages, translation data suggest that the Word Association Model better accounts for the performance of bilingual speakers who are less proficient in L2 (Chen & Leung, 1989; Kroll & Curley, 1988). Specifically, less proficient bilingual speakers more quickly translate words than name pictures in their L2, suggesting mediation through L1 for picture naming rather than a direct L2-conceptual link. Proficient bilingual speakers, however, perform picture naming and translation tasks at roughly similar speeds, supporting access to a direct L2-conceptual link.

The Revised Hierarchical Model (Kroll & Stewart, 1994) addresses this lack of parsimony, allowing each language direct access to the concepts store, as well as a direct connection between the two lexical stores. Initially, L2 learners would access L2 word meanings through L1 via the connection between the L1 and L2 lexicons. With increased fluency, however, speakers are able to conceptually mediate L2 directly as a link between the concepts store and the L2 lexicon develops; importantly, the lexical link between L2 and L1 does not disappear with the formation of this new conceptual link. This model also allows asymmetry in the strength of lexical-to-conceptual connections. For example, initial dependence on L1 for L2 will result in a stronger lexical link.
along the L2 to L1 path, and because L1 initially holds privileged access to meaning, a stronger link between L1 and the concepts store compared to the link between L2 and the concepts store. Indeed, this configuration has received support from investigation of the bilingual lexical semantic system via neuroimaging (Hernandez et al., 2001), picture-word interference (Hermans, Bongaerts, de Bot, & Schreuder, 1998), and semantic comparison protocols (Edmonds & Kiran, 2004).

**Influential Linguistic Variables**

In addition to language fluency as described above, a number of linguistic variables may influence language organization and abilities in bilingual individuals. For example, using a model similar to the Revised Hierarchical Model, Paivio, Clark, and Lambert (1988) found that concreteness affects lexical retrieval in bilingual individuals. According to the dual coding theory (Paivio & Desrochers, 1980), separate but connected verbal representations exist for each language, and these are connected to a shared imagery system. Following this theory, concrete words could be stored and accessed through a combination of verbal and image associations, whereas abstract concepts could be accessed solely through verbal coding. Therefore, in bilingual speakers, concrete words could be translated directly between the two verbal systems or indirectly through the imagery system. Indeed, Paivio et al. (1988) found that bilingual individuals demonstrated better recall of concrete versus abstract words. Similarly, Kiran and Tuchtenhagen (2005) examined the effect of imageability on the naming and semantic judgment abilities of 16 Spanish-English participants, one of whom had aphasia, and found that regardless of the presence of aphasia, task performances were better when concrete stimuli were used.

Cognate status also appears influential. Generally, cognates are words that share meaning and form across languages (e.g., lamp in English and lampara in Spanish; Goral et al., 2006; Kroll & DeGroot, 1997). Across studies, however, researchers have applied different definitions and theories of cognates. For instance, for a pair of words to be considered cognates, Roberts and Deslauriers (1999) used the combination of a subjective judgment across three authors and an analysis of features and phonemic similarity with a minimum feature overlap of 70%; Lalor and Kirsner (2001), on the other hand, defined cognates as morphologically related words. These varying definitions reflect, at least in part, two competing explanations of cognates: phonological versus morphological models.

According to phonological models, cognates share a phonological-sublexical base so that during language production, there is phonological activation of not only the target word but also the translated form, strengthening both forms (Costa, Santesteban, & Caño, 2005). Given this phonological overlap, cognate effects might be viewed as products of neighborhood density (i.e., the number of phonologically similar words that can be formed by changing one sound in the target word). Compared to words with few neighbors, words with dense neighborhoods, which would include their cognates, can reach higher activation levels because, as phonological segments of words are activated, they feed activation back to the target lexical node so that all words in the neighborhood are activated. According to morphological cognate models, bilingual and monolingual systems work similarly (Kirsner et al., 1993; Lalor & Kirsner, 2001): Words are clustered together according to shared morphology, regardless of whether they belong to the same or a different language. Consistent with this view, cognates show a long-term repetition priming effect (i.e., improved accuracy in word production after recent exposure to the word) in bilingual speakers (Cristoffanini, Kirsner, & Milech, 1986). In other words, cognates produce a priming effect similar to that found with morphologically related words in monolingual speakers (Napps & Fowler, 1987). Fortunately, studies have thus far shown a positive relationship across the various definitions of cognates. For example, several investigators have found that in bilingual speakers, including those with aphasia, cognate status positively affects word retrieval and translation accuracy and speed (Goral et al., 2006; Kohnert, 2004; Lalor & Kirsner, 2001). Variation in how the term cognate is defined may result in conflicting research outcomes in the future, however.

**Influential Cognitive Variables**

As previously discussed with respect to neurolinguistic models, the languages of bilingual individuals share a more or less common neuronal system. Additionally, according to psycholinguistic perspectives, these languages have separate but connected lexicons, with a shared concept store. If there is such neural overlap, yet possibly different language stores, how are the languages kept separate, and relatedly, how is the correct language retrieved? To answer these questions, several researchers have begun to explore the role of cognitive processes.

Some theorists have proposed that successful language use in bilingual individuals may be achieved through a combination of activation and inhibition. According to Paradis’s (2004) Activation Threshold Hypothesis, activation of any linguistic property (e.g., word, syntactic construction, phonotactic schema) within one language causes automatic inhibition of the other. This inhibition is not language-specific. Instead, the targeted item must receive more activation than competing forms, including alternate language possibilities. To inhibit these competing forms, their activation thresholds are raised. The more often a form is activated, the lower its threshold becomes, resulting in easier activation over time. Decreased use of other forms increases their activation thresholds, making them more difficult to access over time. Alternatively, in a somewhat modified version of Paradis’s model, Costa and Santesteban (2004) proposed that with increasing proficiency, bilingual speakers move away from inhibitory control to language-specific selection. Highly proficient bilingual speakers retrieve target words via a language-specific lexical selection mechanism rather than through inhibitory control because words from the non-target language do not compete for lexical selection and therefore do not require suppression. Importantly, both theories rely on inhibitory forces to some degree for correct lexical retrieval. Whether these inhibitory processes overlap with those used during other, nonlinguistic inhibition tasks, as suggested by Green (2005), has yet to be determined.

To review, psycholinguistic research suggests that bilingual speakers have a shared, common conceptual store for
their languages and identifies several variables that can influence lexical retrieval accuracy and speed. Although further research is needed to resolve issues such as the nature and relationships of the lexical stores and the mechanisms underlying cognate effects on lexical retrieval, data accrued thus far through the development of both psycholinguistic and neurolinguistic models collectively support that compared to monolingual speakers, bilingual speakers develop and utilize some unique language mechanisms. Indeed, the following section reviews how bilingual clients with aphasia can experience language recovery differently than monolingual speakers.

Bilingualism and Aphasia

Bilingual clients with aphasia demonstrate a variety of recovery patterns in terms of the relative impairments of their two languages (Paradis, 1977). These patterns can be quite distinct from those of monolingual speakers and in the research literature have been described or explained in terms of output abilities, translation abilities, and cognitive factors. Because most bilingual aphasia research has focused on expressive output rather than comprehension, the primary focus of this section is recovery of expressive abilities.

Recovery Patterns: Output Abilities

During the acute recovery phase (i.e., up to approximately 4 weeks after aphasia onset), a client may experience substantial change across either or both languages, dramatic differences between the languages, or both, resulting in a variety of dynamic, bilingual aphasia recovery patterns (see Table 1; Fabbro, 2001a; Green, 2005; Paradis, 1977). For instance, Fabbro (2001a) examined 20 right-handed, bilingual Italian-Friulian speakers using the Bilingual Aphasia Test (BAT; Paradis & Libben, 1987) and found that approximately 65% of these clients exhibited parallel recovery, 20% had greater impairment of L2, and 15% had greater impairment of L1. Similarly, in a review of 132 cases, Paradis (2001) found that approximately 61% exhibited parallel recovery, 18% differential recovery, 7% blended, and 5% selective.

Despite agreement that diverse recovery patterns may occur, exactly what contributes to a given client’s recovery pattern is still debated. Over the course of several years, Fabbro (2001a) assessed and compared the recovery profiles of 20 right-handed, bilingual clients with aphasia, all of whom had learned their L2 between 5 and 7 years of age. He found that none of the following variables could reliably predict recovery patterns: (a) language status (i.e., native language or currently most used language), (b) lesion type or site, (c) environments in which the languages were used, (d) aphasia type, or (e) manner in which the languages were learned. After an extensive review of patients and their various recovery patterns, Paradis (1977) concluded that whereas many factors have been proposed to influence recovery pattern, such as age, proficiency, context of acquisition, and type of bilingualism, recovery patterns most likely result from a combination of these factors.

Recovery Patterns: Translation Skills

Bilingual clients with aphasia can demonstrate different impairment and recovery of translation abilities. Table 2 shows the four primary types of translation deficits that have currently been identified—inability to translate, spontaneous translation, translation without comprehension, and paradoxical translation—and their characteristics (Fabbro & Paradis, 1995; Paradis et al., 1982). A translation disorder may affect either language compromising translation from L1 to L2 or from L2 to L1. To account for the variety of translation disorders, Paradis (1984) suggested that translation may consist of two components, one that allows translation from language A to language B, and another component for translation from language B to language A. Following this, when a translation disorder occurs, it may be due to (a) one of the components being negatively affected, with the other part intact, (b) both components negatively affected to similar degrees, or (c) both components negatively affected but to different degrees.

The ability to translate is a cognitive task that goes beyond being able to speak and understand two languages (Paradis et al., 1982). The skill of translating involves switching languages and is normally under voluntary control; when there is a translation disorder, however, the translation may be automatic, such as in the case of spontaneous translation (Perecman, 1984). Perecman differentiated spontaneous translation from language mixing in terms of their different levels of cognitive processing: She proposed that a

<table>
<thead>
<tr>
<th>Recovery pattern</th>
<th>Language characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel recovery</td>
<td>Recovery of languages parallels the premorbid relative abilities. If one language were stronger premorbidly, it would return to being stronger.</td>
</tr>
<tr>
<td>Differential recovery</td>
<td>One language is recovered much better than the other compared to premorbid abilities.</td>
</tr>
<tr>
<td>Antagonistic recovery</td>
<td>One language is initially available, and as the other language recovers, the initially available language disappears.</td>
</tr>
<tr>
<td>Alternating antagonism</td>
<td>Repetition of the above pattern with languages alternating in availability. This may occur within cycles ranging from 24 hr to several months.</td>
</tr>
<tr>
<td>Blending recovery</td>
<td>Uncontrollable mixing of words and grammatical constructions of two or more languages even when attempting to speak in only one language. This should not be confused with the common bilingual practice of code switching.</td>
</tr>
<tr>
<td>Selective aphasia</td>
<td>Language loss only in one language with no measurable deficit in the other.</td>
</tr>
<tr>
<td>Successive recovery</td>
<td>The recovery of one language before the other(s).</td>
</tr>
</tbody>
</table>

Note. Adapted from Paradis (2004) and Fabbro (2001a).
spontaneous translation deficit may result from a prelinguis-
tic processing disorder, whereas language mixing is a lin-
guistic level disorder. Accordingly, a translation disorder
day be part of a larger conceptual disorder that affects other
behaviors in addition to language. It cannot be assumed,
however, that the presence of spontaneous translation in the
speech of a person with aphasia indicates a deficit. Grosjean
(1985) proposed that some of what appears as involuntary
translation may in fact be a deliberate communicative strat-
ogy used to increase communication effectiveness.

Recovery Patterns: Impact of Concomitant
Cognitive Deficits

Given that cognitive abilities have been implicated in the
development and use of more than one language (e.g., Green,
2005), it is possible that cognitive deficits could contribute
to at least some bilingual recovery patterns. For example,
impaired cognitive control could lead to differing degrees of
too much or too little inhibition, and consequently, impaired
ability to maintain a given language and various recovery
patterns: permanent inhibition (i.e., selective recovery), tem-
porary inhibition (i.e., sequential recovery), alternating in-
hibition (i.e., antagonistic recovery), greater inhibition in one
language (i.e., differential recovery), and loss of inhibition
(i.e., blending; Green, 1986).

A possible result of impaired top-down control is patho-
logical code switching, a pragmatic disorder in which indi-
viduals are unable to control language switching and
consequently code switch in unacceptable circumstances
leading to communication breakdowns (Fabbro, Skrap, &
Agioti, 2000). That is, due to impaired top-down attentional
control, access to the appropriate set of lexical concepts
within the target language may be compromised by com-
petition from the other language. For example, Fabbro et al.
 reported on a client who exhibited pathological switching
even when the interlocutor did not understand the alternate
language. In addition to the pathological switching, the client
exhibited behavioral and verbal disinhibition. Muñoz and
colleagues (1999) also observed that only participants with
aphasia demonstrated higher frequencies of certain switching
patterns, communication difficulties due to code switching
when the social or pragmatic expectation was continued use
of one language, frustration with an inability to use the ap-
propriate language, or an inability to stop pathological code
switching. Similarly, Mariën, Abutalebi, Engelborghs, and
De Deyn (2005) reported on uncontrolled language mix-
ing following deep left frontal lobe lesions, suggesting the
involvement of a control mechanism. In a study involving a
dilingual speaker of English, French, and Hebrew, Goral et al.
(2006) found that involuntary switching (referred to as “lan-
guage interference”) occurred mainly in French, the least
recovered language, and that the interference occurred be-
tween the languages that shared the most vocabulary. For ex-
ample, target English words were more frequently substituted
with French rather than Hebrew words, despite the client’s
stronger Hebrew.

As discussed with spontaneous translation, the presence
of code switching does not only imply an inability to control
language output: Whereas increased mixing may at times be
atypical according to normal standards, for clients with apha-
sia it could be a conscious or unconscious self-cuing strategy
to access the correct word in either language or to enhance
communication in general (Grosjean, 1989). In this case, the
language switch or mix could function as a paraphasia that
only interferes with communication if the interlocutor does
not speak the language.

Recovery Patterns: Learning Factors

Learning mechanisms such as Hebbian learning may also
contribute to variation in bilingual aphasia recovery (Green,
2005). Hebbian learning, a primary means of function resti-
tution, involves increased synaptic efficacy through neuronal
reconnection, resulting in increasingly strong connections
over time (Hebb, 1949). Stronger undamaged neuronal cir-

recovery; and (c) if the lexical semantic system of one lan-
guage is impaired marginally more than that of the other, that
weaker language may not benefit from Hebbian learning,
resulting in differential recovery of the already stronger
language.

Recovery Across Language Processes and Modalities

As with monolingual aphasia, recovery varies significantly
across language processes and modalities with bilingual aphasia.

TABLE 2. Translation deficits found in bilingual aphasia.

<table>
<thead>
<tr>
<th>Translation deficits</th>
<th>Language characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inability to translate</td>
<td>Inability to translate from either language to either language</td>
</tr>
<tr>
<td>Paradoxical translation</td>
<td>Ability to translate in one language but not the other</td>
</tr>
<tr>
<td>Translation without comprehen-</td>
<td>Ability to translate language promptly but lack the ability to</td>
</tr>
<tr>
<td>sion</td>
<td>understand its meaning</td>
</tr>
<tr>
<td>Spontaneous translation</td>
<td>Inability to inhibit translating, producing involuntary</td>
</tr>
<tr>
<td></td>
<td>translations of utterances that they or others have said</td>
</tr>
</tbody>
</table>

Note. Adapted from Fabbro (2001b).
This section examines pertinent research regarding recovery of syntax, semantics, reading, and writing. Other language processes (e.g., phonology, pragmatics) and modalities (i.e., gesture) have received less empirical attention, and thus further research is needed to determine whether bilingual clients with aphasia demonstrate unique recovery patterns in these aspects of communication.

**Morphosyntax.** Patterns of grammatical recovery can be highly variable in bilingual speakers due to core linguistic differences in their languages, such as the relative importance of specific linguistic properties, for example, morphological markers, word order, and prosody (Green, 2005). As explained by Paradis (1988), language impairments depend on how the system can break down, which is determined by the structure of the language system. For example, syntactic disorders apparent at the surface of a speaker’s grammar are dependent on the language’s structure; accordingly, morphological breakdown may be more noticeable in a highly inflected (e.g., Spanish) versus minimally inflected language (e.g., English). Indeed, when evaluating agrammatic Italian-Friulian speakers who were exhibiting parallel recovery, Fabbro (2001a) observed different levels of pronoun omission in Italian versus Friulian. Italian is a partial pro-drop language, meaning it allows speakers to “drop” the subject pronoun if the subject can be inferred from the context—for example, if an Italian speaker stated, “Mio padre è avvocato” (“My father is a lawyer”), his or her next sentence could be “Lavora in centro” (“Works downtown”) in which the pronoun “he” can be excluded; conversely, Friulian, like English, is a non-pro-drop language, meaning speakers must use the subject pronoun regardless of the referent’s transparency. The bilingual speakers with agrammatism in Fabbro’s study made more frequent pronoun deletion errors in Friulian than in Italian, suggesting that this error pattern was most likely a consequence of required pronoun use in Friulian. Relatedly, because Italian allows pronoun dropping, pronoun omission errors were nominal: The speakers with aphasia appeared to make fewer errors, simply because they were able to avoid this syntactic mistake. Another example pertains to case- and gender-marking deficits, which vary subsequent to aphasia onset depending on the individual’s languages (Menn, O’Connor, Obler, & Holland, 1995). Speakers with aphasia who use languages with case marking (e.g., German, most Slavic languages) often demonstrate substitution errors in case marking (e.g., use an incorrect morpheme to indicate nominative/subjective case). As case marking is limited to the possessive “s” in English, case errors are infrequent in English speakers with aphasia. Similarly, gender-marking errors will be common if speakers with aphasia use languages that have gendered nouns (e.g., for the English noun phrase “a/the house,” Spanish requires the use of a gender-specific determiner una/la and the feminine word ending a).

Variable syntax profiles among bilingual speakers with aphasia may also result from differences in the nature of their syntactic impairment. There are two general views to account for syntactic problems in aphasia: a central deficit disorder, in which syntax competence or knowledge is impaired, and a peripheral deficit disorder, in which syntax performance is impaired (Grodzinsky, 2000; Paradis, 1988). Impaired syntax competence assumes that all grammatical knowledge is centrally represented, and thus, an impairment would affect all language modalities. Conversely, a peripheral deficit is defined as a modality-specific deficit and is considered a performance deficit. A peripheral deficit could, then, produce a “double dissociation” wherein an individual with aphasia may, for example, demonstrate syntactic breakdowns in writing but not speech or reading (Bub & Kertesz, 1982; Paradis, 1988). With respect to bilingual speakers with aphasia, similar deficits across languages would suggest a central deficit (Paradis, 1988). If the deficit is peripheral, there may be a dissociation between languages, depending on what syntactic operation has been affected, resulting in differential language outcomes such as: (a) if there is a structure dependent deficit (e.g., difficulties with tense or case marking), the language with the more extensive morphological system will be more impaired; (b) if lexical access is impaired, the language with greater use of free or bound grammatical morphemes will be more impaired; and (c) if a syntactic level deficit occurs, the language that relies more heavily on word order would be more impaired.

As proposed by MacWhinney, Bates, and Kielg (1984), cue strength may also account for differences in productive syntactic deficits among speakers’ various languages. These researchers demonstrated that cue strength, the degree to which a given grammatical aspect can be utilized for sentence interpretation, varies across languages: The stronger the relative cue, the more likely the cue will be preserved. To illustrate, participant-verb-object is the canonical order for both Spanish and English, but Spanish speakers have more freedom to vary word order from this canonical order. Therefore, canonical word order has greater cue strength in English, and accordingly, its use often remains preserved following aphasia onset in English speakers. In languages in which canonical word order has a lower cue strength, such as Spanish, it may be less preserved. Similarly, to compare grammatical errors across languages with differing levels of morphology and word-order freedom, Bates, Friederici, and Wulfeck (1987) examined adults with Broca’s aphasia, Wernicke’s aphasia, or no aphasia who spoke English, Italian, or German. All three languages have a canonical, participant-verb-object order, but Italian and German also allow quite flexible word order. To compensate for this flexibility, these two languages utilize morphology for sentence interpretation in that (a) German has a significant and productive case system attached to articles, and (b) Italian requires reliance on agreement markers. Conversely, English utilizes little morphology, necessitating dependence on word order for interpretation. These language differences, according to a traditional impairment perspective, could place German and Italian language users at a disadvantage if aphasia impairs morphology more than other language features (e.g., word order). Bates et al. found, however, that both Italian and German participants with Broca’s aphasia maintained morphology use to a much greater degree than would be expected; in fact, no aphasia type was associated with omission rates equal to that demonstrated by English speakers with aphasia. Although similar syntactic recovery patterns have been observed in other morphologically rich languages such as Spanish (e.g., Ostrosky-Solis, Marcos-Ortega, Ardila,
Roselli, & Palacios, 1999), additional studies comparing the relative maintenance of morphology across languages would be beneficial, with tighter control for language impairment and testing tools. Regardless, this line of research indicates that reconsidering previous assumptions about morphosyntax and aphasia is needed, particularly given that these language-specific differences influence the appropriate identification and selection of morphosyntactic treatment targets.

Another example relates to the proposed dichotomy between agrammatism and paragrammatism. Agrammatism is typically characterized by telegraphic speech, including omission of grammatical inflection and function words, reduced phrase length and syntactic complexity, and Broca’s area lesions (Goodglass, Kaplan, & Barresi, 2001); in contrast, paragrammatism is typified by empty speech (i.e., words or phrases meaningless to the communication situation, including indefinite terms, neologisms, other paraphasias, and repetitions), inflection substitution errors, frequent use of functors, and Wernicke’s area lesions. This dichotomy of omission versus substitution, however, may be overstated due to the disproportionate number of aphasia studies done in English, a word-order strict, morpheme-impoverished language. For example, in a study of agrammatism in two bilingual Spanish-Catalan speakers with Broca’s aphasia, the participants were observed to make verb errors in both languages that were considered uncharacteristic of traditional descriptions of Broca’s aphasia (de Diego Balaguer, Costa, Sebastián-Galles, Juncadella, & Caramazza, 2004). Therefore in bilingual speakers, patterns of grammatical deficits in clients with aphasia can differ from what was previously assumed, and whether and how these traditional grammatical profiles apply to other languages, particularly within bilingual speakers, requires further examination.

A growing literature thus indicates that the linguistic characteristics of each language used by bilingual speakers with aphasia must be considered when describing their morphosyntactic strengths and weaknesses. Failure to consider these influential linguistic factors may result in inaccurate documentation of the presence, severity, and nature of grammatical deficits.

**Lexical semantics.** Specific considerations also apply to the recovery of lexical semantic abilities in bilingual speakers with aphasia. Whereas much research has focused on monolingual speakers of English, research involving monolingual speakers who speak a language other than English suggests that the types and frequencies of paraphasias vary across languages. Consequently, types and frequencies of paraphasias may also vary across a bilingual speaker’s different languages. For example, Ardila (2001) observed that Spanish speakers produce more phonemic or literal paraphasias involving vowels than do speakers of other languages. This is possibly due to a one-to-one correspondence of vowels and their sounds, making vowels in the Spanish language more salient. Research with bilingual speakers has also highlighted some unique paraphasia considerations. For instance, semantic paraphasias may sometimes result from interlanguage interference, with the speaker choosing the correct word, but from the wrong language. Goral et al. (2006) reported on a trilingual speaker whose L1 was Hebrew but who used English and French more frequently than Hebrew at the time of his aphasia onset. Levels of interlanguage interference errors varied across his languages, which the authors attributed to differing levels of lexical connectedness among his languages. That is, when the client was speaking in French, he produced many non-target language words in English, which often were cognates. Conversely, when speaking Hebrew, a language less related to either French or English, he produced significantly fewer interference errors. Therefore, interlanguage interference represents a possible source of paraphasias not encountered when dealing with aphasia in monolingual speakers.

Several unique factors may influence lexical access speed, accuracy, and recovery in bilingual speakers with aphasia. For example, investigators have begun to explore the effects of cognate status on naming skills and have found that cognates elicit better pretreatment performance than noncognates in participants with aphasia (Kohnert, 2004; Lalor & Kirsner, 2001; Roberts & Deslauriers, 1999). This benefit may not, however, apply to both languages, as Roberts and Deslauriers (1999) found that in adults with aphasia, cognate status only improved L2 naming accuracy. Therefore, this line of bilingual aphasia research, albeit limited, has consistently revealed improved naming accuracy and speed with cognates versus noncognates, with additional research needed to identify the limits of this generalization.

**Reading and writing.** Recovery of reading and writing abilities in bilingual individuals with aphasia has received some empirical attention. Some research suggests that these individuals may utilize different reading strategies in their different languages, particularly if their languages diverge in terms of orthography transparency. For instance, with English, a language with nontransparent orthography (i.e., one cannot always “sound out” words), individuals may use a combination of phonological and logographic (i.e., whole word) reading approaches (Sampson, 1985). Spanish, in contrast, has transparent orthography, as words are pronounced as written, and allows accurate reading aloud even when words are completely unknown (Ardila, Rosselli, & Pinzon, 1989). As a result, individuals may more easily and regularly employ a phonological route to read Spanish (Ardila, 1991). Iribarren, Jarema, and Lecours (1999) have pointed out, however, that whereas transparent orthography may favor a phonological reading route, it does not preclude the use of logographic reading. Indeed, researchers have identified the use of logographic reading in participants from language backgrounds with transparent orthographies (e.g., Basso & Paulin, 2003; Iribarren et al., 1999). Clinicians should be aware of these potential cross-linguistic differences in reading routes, which may in turn produce different patterns of reading deficits subsequent to aphasia onset in bilingual individuals. For example, disturbance of just one reading route could impair reading one language more than the other or, at the very least, influence what type of stimuli might be appropriate.

Reading disturbances subsequent to aphasia onset may include surface dyslexia, deep dyslexia, or phonological dyslexia (Dérouesné & Beauvois, 1979; Marshall & Newcombe, 1973). Just as the surface manifestations of these dyslexia types differ, so may their manifestations across languages, making the identification of such deficit patterns difficult. For
example, surface dyslexia, characterized by a regularization and thus misunderstanding of irregularly spelled words, may be uncommon in speakers of orthographically transparent languages (Iriberri, 2007). Conversely, compared to clients who regularly employ both routes to read their language(s), clients using languages that primarily rely upon a phonological reading route may be at greater risk for severe forms of phonological dyslexia, a reading disorder distinguished by impaired use of the phonological reading route.

As with reading, orthography transparency may influence the types of writing profiles observed in bilingual clients with aphasia. For example, Spanish, Italian, and Russian have a phonological writing system in that words are spelled as they sound (Ardila, Rosselli, & Ostrosky-Solis, 1996); that is, the letters are pronounced the same way, regardless of the word in which they are found. English and French, conversely, are not purely phonological, as evidenced by the fact that a written word in either of these languages may be quite different from its phonographic form; as a result, writing in these languages is achieved through a combination of grapheme/phoneme correspondence (i.e., a phonological route) and visual gestalt, or whole-word recognition (i.e., lexical semantic route). Therefore, use of either a phonological and/or a lexical semantic system for writing will depend, at least in part, on the particular linguistic characteristics of the language.

Ardila et al. (1996) argued that in languages such as Spanish, two different types of writing errors can be found: homophone or orthographic errors and nonhomophone errors. Homophone errors are phonologically correct and occur when two letters have the same phonological quality, could be interchanged, and thus still produce a word that sounds correct, despite being misspelled. For example, in Spanish, letters 2 and 3 both are associated with the /x/ sound, so mujer (woman) could be spelled phonetically as either “muger” or “mujer.” These spelling errors exist in healthy populations. Conversely, nonhomophone errors involve some letter additions, omissions, or substitutions, which change the word’s written representation (e.g., “muer” for “mujer”). These errors are only found in brain-damaged individuals. For instance, using a dictation task, Ardila et al. examined the occurrence of homophone and nonhomophone errors in the written Spanish of 92 healthy participants and 14 who had brain damage (i.e., individuals with Broca’s aphasia, Wernicke’s aphasia, or right hemisphere damage). Whereas all groups made homophone errors, the groups with aphasia most frequently made nonhomophone errors such as letter substitutions, additions, and omissions. Additionally, participants with Broca’s aphasia made semantic paragraphias (e.g., lapis → papel, judicial → policia), and participants with Wernicke’s aphasia made more morpheme substitutions and fewer omissions than those with Broca’s aphasia.

Due to increased transparency in the orthography of Spanish and other similar languages (e.g., Italian and Russian), it may be possible to identify unique writing errors such as homographic and nonhomographic, with the latter being prevalent only among the brain injured population. The presence of these errors and the subtypes made (e.g., letter additions vs. omissions) can vary across aphasia type. To date, most reading and writing research that extends beyond English, however, has been done with monolingual participants with aphasia. Accordingly, future studies are needed to examine whether and how these different surface manifestations identified in monolingual individuals might vary when a person reads and writes in more than one language, particularly if the languages differ in terms of orthography transparency.

In summary, although bilingual aphasia research has revealed significant variation in recovery across morphosyntax, lexical semantics, reading, and writing, additional investigations are needed to understand fully the nature of this recovery process. Regardless, unique recovery patterns dictate that novel assessment and treatment approaches, some of which are reviewed below, should be considered when providing direct services to patients with bilingual aphasia.

**Implications for Assessing and Treating Clients With Aphasia**

Due to the aforementioned differences between bilingual versus monolingual aphasia, managing bilingual aphasia will necessarily diverge, at least in part, from monolingual aphasia diagnostic and treatment practices. That is, traditional procedures documented as effective with monolingual speakers may require alteration or complete revision to meet the needs of bilingual speakers. Although nominal empirical research is currently available to guide effective management of bilingual aphasia, growing anecdotal evidence is emerging from clinical practice.

Because bilingualism varies dramatically across individuals, it is imperative that clinicians and researchers avoid several common false assumptions. First, it cannot be assumed that premorbid abilities in each language were equivalent, or that being bilingual implies a certain level of proficiency for all bilingual speakers (Muñoz & Marquardt, 2003). Second, SLPs should not attribute postmorbid differences between the languages to brain damage, as they may already have differed premorbidly (Kirin & Tuchtenhagen, 2005). Following this reasoning, SLPs must consider the various domains of language use when developing management plans for their bilingual clients with aphasia.

**Assessment**

To obtain an accurate assessment of language proficiency in bilingual clientele, several measures must be taken, some of which overlap with those used to evaluate monolingual clients and some of which are unique to meet bilingual clients’ needs. When dealing with the sudden onset of aphasia, such as in stroke, there are certain recommendations for approaching assessment as recovery unfolds. During the acute recovery phase, as is recommended for monolingual speakers (e.g., Holland & Fridriksson, 2001), assessment should focus on evaluating basic communication needs due to the dynamic nature of acute recovery (Fabbro, 2001a). During more chronic recovery phases when language abilities stabilize, more comprehensive assessment can be completed. Furthermore, during and following treatment, periodic re-assessments are required to monitor for changes in recovery patterns. Throughout this assessment process, SLPs must also...
determine which languages to include in therapy or, alternately, to identify specific goals for each language.

If the SLP does not speak the client’s language, interpreter assistance may be needed (see ASHA, 1989, for guidelines on proficiency requirements). Due to difficulties associated with using interpreters (e.g., training, reliability), interpreters should only be employed when no SLP is available who can speak the client’s language (ASHA, 1989). Importantly, family members should only be used as a last resort, because it may be difficult for them to participate objectively in assessment without providing personal input into the process. Whereas one might assume that an SLP who is proficient in each of the client’s languages would be best qualified to administer these tests, this is not always the case. For example, if a client is suspected of pathological switching, it is important that the SLPs doing each language assessment speak only that language (Grosjean, 1998). For instance, when assessing a client’s Spanish skills, it would be ideal to have a tester who only spoke Spanish so that any English utterances could not be assumed to be intentional.

With respect to formal test selection, Paradis (2004) warned against the folly of using tests that are simply translations of English tests; such tests are constructed with little or no consideration of linguistic and possible cultural differences. Instead, SLPs must identify linguistically equivalent tests that evaluate similar types and levels of abilities in each of the clients’ languages. Linguistic equivalence implies that all areas of linguistic comparison (e.g., vocabulary, syntax structures) are of equal difficulty in the respective languages. For example, across tests, grammatical constructions must have the same level of difficulty or complexity; simply translating a particular grammar tense or construction does not guarantee that the construction is equally difficult in the other language. Minimal pairs or rhyming words that are used for phonological tasks will obviously differ if simply translated and thus no longer meet the phonological task’s requirements. Likewise, whereas vocabulary on aphasia batteries is typically controlled for frequency of use, translation equivalents in another language may have different frequencies, making them more or less common or difficult. Finally, because languages differ structurally (e.g., word order, inflectional morphology, complexity of construction such as passive voice), the structural complexity and relevance of a structure may also vary across languages. To be equivalent, a structure of similar complexity rather than similar use needs to be chosen. These are only a few ways in which structures may differ, exemplifying why an assessment battery needs to be completely rewritten prior to using it cross-linguistically. As a result, it may be most wise to use a testing tool that has been specifically designed for multiple languages.

Perhaps the most frequently used bilingual aphasia test, at least in the research literature, is the BAT (Paradis & Libben, 1987). The BAT does not classify aphasia type but rather measures bilingual clients’ ability to use each of their languages in unilingual settings. That is, it identifies which language skills and linguistic structures have been affected.
for each language. The BAT includes a detailed language use history questionnaire and sections to assess deficits in language use and translation, as well as language interference issues. A computer program is available to evaluate responses in more than 100 different languages and make comparisons across languages. Importantly, the BAT is not simply a translation of an English aphasia test; rather, tests in each language were developed with linguistically and culturally appropriate words and syntactic structures (Fabbro, 2001a). A few other aphasia batteries are available for bilingual clientele and can be used for classification of aphasia. These include the Multilingual Aphasia Examination—Spanish Version (Benton & Hamsher, 1994; Rey, Sivan, & Benton, 1991) that has been standardized and normed on a Latino sample, the Western Aphasia Battery—Spanish Version (Kertesz, Pascual-Leone, & Pascual-Leone, 1990), a Spanish version of the Psycho-linguistic Assessment of Language Processing in Aphasia (Kay, Lesser, & Coltheart, 1992), a Spanish version of the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1986) that has available norms (Rosselli, Ardila, Florez, & Castro, 1990), and the Aachen Aphasia Test (Huber, Poock, Weniger, & Willmes, 1983), which is available in several languages.

In addition to standardized testing, SLPs often obtain and analyze language samples for quantity and quality of production. Here again, a cross-linguistically comparable measure must be used. Because of differing structural characteristics of languages, measuring language quantity according to procedures developed for English may underestimate or overestimate problems in other languages. For example, syntactic complexity is often quantified by computing the mean length of utterance, the number of verbs per utterance, and the number of subordinate clauses (Paradis, 2004). Because norms for these measures vary across languages, the client’s performance in each language needs to be compared against its respective language norms, rather than solely compared to the other language. Additionally, Paradis suggested that analysis procedures may require modifications. Take for example the type-token measure, which typically divides the number of different words (i.e., types) by the total number of words (i.e., tokens) to measure lexicon diversity. To remediate some problems associated with lexical structure differences across languages, Paradis suggested that when doing a type-token analysis, only lexical items (not grammatical words) should be counted. For instance, a language without articles or copulas would have a higher type-token ratio than a language with these word types, because it would have fewer redundant words, appearing artificially more diverse. Similarly, if a language uses noun phrases as compound words, each constituent of the compound should be counted as one word when comparing to languages in which several separate words mean the same thing. Finally, if reading and writing are assessed, SLPs must be aware of any visual field cuts or neglect that could differentially affect two languages if they are read from opposite directions (Paradis & Libben, 1987). Therefore, SLPs must be cognizant of these and other possible language differences so as to make accommodations that will ensure that bilingual clients’ abilities are accurately assessed. Failure to do so could result in incorrect assessment of aphasia presence, severity, or classification.

Due to increasing evidence that possible concomitant, cognitive disorders may influence aphasia signs and recovery in monolingual speakers (e.g., Murray, 1999) as well as bilingual speakers (e.g., Green, 2005), cognitive testing may be indicated. Similar to the limited availability of language tests, there are few appropriate tools for examining multilingual clients’ cognitive abilities, although researchers are beginning to tackle this issue (Rey et al., 2001). A limited set of translated language and cognitive tests are listed in the Appendix, and a more complete discussion of normative data available for various language and cognitive tests can be found in Roberts (2001).

In summary, clinicians working with the bilingual aphasia population must consider and thus evaluate their clients from a multitude of angles to develop the most effective and efficient treatment (Fabbro, 2001a; Roberts, 1998). For example, Green (2005) advocated that an essential first step in planning treatment is to assess and understand the client’s recovery pattern across and within languages to create practical goals that will target specific loci of breakdown in the language system. Next, clinicians need to understand (a) what may be driving particular recovery patterns, (b) whether cognitive deficits are in any way contributing to language behaviors, and (c) how these factors interact with their clients’ needs and wishes. Additionally, depending on clients’ needs and preferences, clinicians must determine which language or languages to target and then maximize treatment efficiency by analyzing those languages for similarities of underlying structure to determine how best to exploit these similarities in concert with natural learning processes. Finally, the client’s communication community can also influence assessment and treatment choices and recovery patterns and thus be utilized as a valuable resource in all aspects of client management (Laganaro & Overton Venet, 2001).

Treatment

Whereas researchers often provide suggestions regarding treatment of bilingual aphasia (e.g., Paradis, 2004; Roberts, 2001), sufficient experiential support of these suggestions is currently lacking. Additionally, the available empirical literature has so far focused on a limited set of linguistic abilities (e.g., word retrieval; Edmonds & Kiran, 2006). These initial investigations, however, can provide both clinicians and researchers with ideas for developing treatment protocols for bilingual clients and highlight the many management issues unique to the bilingual client population that still need to be resolved in future studies.

For most bilingual clients, the same principles applied to design effective therapy for monolingual speakers would be used. For example, selected treatment strategies should ensure client success by choosing accessible language targets (Roberts, 2001). Additionally, some existing traditional treatments have been found effective with bilingual clients, including the general stimulation approach (Watamori & Sasnuma, 1976, 1978)—in which intensive auditory stimulation, repetition, naming, reading, and writing tasks are practiced at varying levels of linguistic complexity—and phonemic cuing (Roberts, de la Riva, & Rhéaume, 1997), in which initial phonemes of words are used to facilitate lexical
retrieval. Other treatment protocols (e.g., Melodic Intonation Therapy, which uses music-like intonation and rhythm to aid spoken word and phrase production; Sparks, Helm, & Albert, 1974) have been successfully used with monolingual speakers of other languages (see Roberts, 2001, for a review), but additional research is needed to determine not only the effects of these treatments on bilingual aphasia but also the degree of cross-linguistic generalization they can achieve. For example, to address word retrieval difficulties, Galvez and Hinckley (2003) provided to a client with transcortical motor aphasia a cuing hierarchy treatment in each of his languages. The client, a 71-year-old left-handed man, reported equal proficiency in Spanish and English prior to his stroke; he reportedly used both languages daily, Spanish at home and English at work. Whereas treatment produced within-language improvements across language modalities, no cross-linguistic generalization was observed, suggesting that this treatment may not generalize across languages.

Aphasia treatment must also extend beyond protocols developed for monolingual English clients. Goals should be based on pre- and postmorbid language proficiency and use patterns (Roberts, 2001); for example, reading therapy should only be applied to the languages that the client premorbidly used for reading. SLPs should also consider specific characteristics of each of their clients’ languages, as syntactic impairments may differ across languages (Ardila, 2001; Bates et al., 1987) and different strategies may be more or less appropriate (Cuetos & Mitchell, 1988; Ostrosky-Solis et al., 1999; Roberts, 2001). For instance, bilingual Spanish/English speakers may use gender as a cuing strategy for word retrieval in Spanish (Roberts, 2001) but not in English due to the lack of gender marking in English. Accordingly, treatment solely based on a monolingual English framework may not exploit the full range of potential strategies available.

With respect to remediating specific language domains, reading and naming treatment studies have demonstrated cross-linguistic generalization when training has focused on shared aspects of clients’ languages (Kiran & Edmonds, 2004; Laganaro & Overton Venet, 2001). Indeed, a cognate therapy approach is based on the possibility that the two lexicons of a bilingual speaker may be functionally and neurologically interconnected, which should thus allow across- as well as within-language gains (Costa et al., 2005; Kiran & Tuchtenhagen, 2005; Lalor & Kirsner, 2001; Roberts & Deslauriers, 1999). For example, Kohnert (2004), adopting a phonological view of cognates, explored cross-linguistic generalization following a therapy to target naming of 10 cognates and 10 noncognates. The participant with aphasia, a proficient Spanish-English speaker whose L1 was Spanish, first received the cognate-based treatment in Spanish and then English. Generalization occurred from L2 to L1 for both cognates and noncognates following English treatment, but only for cognates after Spanish treatment. Therefore, a cognate effect was found with generalization for cognates in both directions. Relatdey, Laganaro and Overton Venet (2001) reported on a Spanish-English speaker with aphasia whose L1 was Spanish but who used English professionally at work. Because reading in both languages was equally impaired, these researchers concluded impairment of similar reading processes in both languages and further hypothesized that if shared reading processes are impaired, treatment aimed at improving the shared processes should result in cross-linguistic generalization. Accordingly, they provided this client two different treatments: first, a lexical, letter-by-letter reading inhibition task, and second, a phonological assembly and encoding task, which included phonological blending activities. Indeed, the lexical treatment evoked generalization from the treated to the nontreated language, supporting the notion that targeting strategies shared by the languages promotes generalization.

Which language is trained may also influence therapy efficiency. Kiran and Edmonds (2004; Edmonds & Kiran, 2006) have shown that lexical semantic treatment of participants’ weaker language may produce generalization to their stronger language. In their 2004 study, a lexical semantic treatment was provided to two Spanish-English speakers with equivalent, postmorbid, across-language deficits, one of whom was pre-morbidly English dominant, while the other was pre-morbidly balanced. They found that pre-morbid dominance contributed to cross-linguistic patterns of generalization: For the participant with a balanced Spanish-English profile, within-language and cross-linguistic generalization was found. That is, treatment for this individual was initiated in Spanish, and generalization was found to semantically related Spanish words (e.g., manzana-naranja), and in English for both the trained item (e.g., manzana-apple) and semantically related items (e.g., manzana-orange). For the participant who was English dominant, within-language generalization to related semantic items was found only in the dominant language (e.g., apple-orange) but not in the weaker language (e.g., manzana-naranja). Cross-linguistic generalization was only found following treatment of the weaker language (Spanish), with generalization to words in the dominant language (English) for both the trained item and semantically related items; cross-linguistic generalization to the weaker language (Spanish) did not occur following treatment of the dominant language (English). In 2006, Edmonds and Kiran again reported cross-linguistic generalization in 2 pre-morbidly English dominant participants only when their weaker language (Spanish) was treated. A third participant, who was pre-morbidly equally bilingual, was only trained in Spanish and demonstrated cross-linguistic generalization to English. Whereas additional studies encompassing more participants and directly comparing treatment protocols are needed, these preliminary findings suggest bilingual aphasia treatment can be designed to maximize cross-linguistic generalization and, thus, treatment efficiency, via training targets in only one language.

Our recent review of the literature identified no empirical studies of syntax treatment for bilingual aphasia. Based on reports of cross-linguistic generalization in other language domains (e.g., Kiran & Edmonds, 2004), however, syntax treatment may be most effective for bilingual speakers when focused on underlying syntactic processes (e.g., inflectional phrase structure) shared across languages rather than on surface structures of just one language. SLPs also need to recall that different syntactic outcomes across languages may reflect the relative importance of corresponding surface structures within each language. For example, as pointed out by Lorenzen & Murray: Bilingual Aphasia Review 311
Bates et al. (1987), the maintenance of morphosyntax may be at least partially affected by its relevance.

Cognitive treatments may be appropriate for those bilingual clients with concomitant cognitive deficits. For instance, Kohnert (2004) developed a nonlinguistic cognitive treatment for a 62-year-old bilingual man with severe nonfluent aphasia. His L1 was Spanish, but he had lived in the United States for 25 years and used English in work and social settings and both languages at home. Kohnert hypothesized that improving cognitive processing efficiency to support language behavior would result in cognitive as well as language improvements. Cognitive training was provided across 14 sessions, each an hour long, and consisted primarily of attention tasks (e.g., visual scanning, visual number, and letter searches). As predicted, following treatment, accuracy and speed on the trained cognitive tasks improved, as did performance of untrained language comprehension (e.g., sentence comprehension) and production (e.g., picture description) tasks. Whether the cognitive training solely contributed to these language gains, however, cannot be established definitively: Whereas the client was most likely beyond spontaneous recovery (i.e., more than 1 year after aphasia onset), there was ample language stimulation and practice during the cognitive training sessions via natural discourse (e.g., greetings, instructions, feedback). Thus, due to the inherent presence of language in most therapy procedures, it is difficult to identify the degree of improvement, which can be attributed to a cognitive treatment.

There are also special considerations when training bilingual clients’ use of compensatory strategies. For example, bilingual speakers with and without aphasia often successfully use one language to cue another, and these self-corrections most frequently involve producing the target word in the wrong language, intentionally or unintentionally, to cue the correct target (Goral et al., 2006; Roberts & Deslauriers, 1999). Given that explicitly teaching self-cuing is a successful word retrieval strategy among clients with aphasia in general (e.g., Abel, Schultz, Radermacher, Willmes, & Huber, 2005), utilizing these self-corrections, the powerful connection of cognates, or both could be effective strategies for bilingual speakers with aphasia, especially if they live in a bilingual community. Additionally, when these self-correction attempts are unsuccessful, use of a cognate, albeit in the wrong language, may still be understood, even by someone who does not speak the “wrong” language (Roberts & Deslauriers, 1999).

Although unintended code switching can interfere with communication intent, its use could be harnessed as a compensatory strategy (Muñoz et al., 1999), particularly if the client with aphasia lives in a bilingual community. In some instances, it may be most efficient to adapt to the client’s strengths by training daily communication partners to understand cognates in the other language or to accept those cognates commonly used as semantic paraphasias by the client. Family members, caregivers, or even coworkers could also be taught vocabulary commonly used within the language with which they are unfamiliar but that the client uses. Viewed from this perspective, code switching can enhance functional communication. To determine if this is an appropriate option, SLPs need to identify their clients’ communication goals, communication environment at home, and ability to manipulate volitionally code switching.

Although augmentative and alternative communicative device use is an option for monolingual individuals with aphasia, a review of the literature indicates nominal exploration of this treatment approach for bilingual speakers with aphasia. Spanish versions of one digitized speech device, the SpringBoard Communication Aid by Prentke Romich Company, have recently been developed and used with bilingual clients (Cross, 2005). This system, designed for persons with apraxia and for children, is available in two Spanish forms, that of Spain and the U.S. domestic market, with a vocabulary set allowing for spontaneous speech. Additionally, device prompts and support materials are provided in Spanish as well as English, so the system can be switched between the two languages. Despite such device availability, SLPs should be aware of cultural barriers to such technological solutions, as ethnic culture and non-English language backgrounds are often barriers to successful device use (Reed & Newton, 2004).

**Summary and Future Directions**

Because individuals who speak more than one language are one of the fastest growing segments of the U.S. population and many of these individuals are at risk for developing medical conditions that can produce aphasia and other communication disorders, there is a growing need to ensure that SLPs are adequately prepared to serve the needs of the bilingual population. This review, which focused primarily on research pertaining to Spanish-English bilingual aphasia due to the dramatic increase in Spanish-English speakers in the United States and the considerable research available focusing on these languages, indicates a dire need for further empirical investigation of many issues pertaining to understanding and managing bilingual aphasia.

First, debate persists regarding how best to quantify and qualify bilingualism and other linguistic concepts (e.g., cognate status) unique to bilingual speakers. It also is not yet clear how certain linguistic considerations (e.g., the nature and relationship of each language’s lexicon) and cognitive factors (e.g., attention, inhibition) influence language selection and use in healthy bilingual speakers; consequently, how these factors contribute to the variety of recovery patterns observed in bilingual aphasia requires further exploration. Second, most bilingual aphasia research has involved relatively weak study designs (e.g., case descriptions, small group designs) and often failed to control for confounding variables such as differing levels of premorbid language abilities (e.g., Bates et al., 1987). Thus, replication and extension of these studies are needed. Lastly, there has been limited development and critical evaluation of assessment and treatment protocols designed to meet the unique characteristics and needs of bilingual clients with aphasia. For example, in research and clinical practice, no consistent means have yet been established to evaluate the pre- and postmorbid language abilities of bilingual clients; regular use of specific interview and/or rating tools and linguistic and cognitive tests may make comparison across future studies more meaningful and evaluation of clients more reliable. Likewise a scant
treatment literature contains mixed findings regarding how to maximize cross-linguistic generalization and has so far focused almost exclusively on remediation of lexical semantic abilities.

In conclusion, demographic data indicate an urgent need for researchers and clinicians to address the many empirical questions and management needs identified in this review. ASHA’s (2003) Code of Ethics requires SLPs to evaluate the effectiveness of their services and only provide services when benefit can reasonably be expected. With nominal research currently available regarding managing bilingual aphasia, SLPs are left to make clinical decisions without the appropriate support. Additional empirical investigation, therefore, is crucial to ensure ethical provision of services to this rapidly growing client population.

References


Menamara, J. (1969). How can one measure the extent of a person’s bilingual proficiency? In L. Kelly (Ed.), Description and measurement of bilingualism (pp. 80–97). Toronto, Ontario, Canada: University of Toronto Press.


Received March 3, 2007
Accepted December 18, 2007
DOI: 10.1044/1058-0360(2008/026)

Contact author: Bonnie Lorenzen, Department of Speech and Hearing Sciences, 200 South Jordan Avenue, Bloomington, IN 47405-7002. E-mail: blorenze@indiana.edu.
### Appendix

**Examples of Cognitive and Language Tests Available in Other Languages**

<table>
<thead>
<tr>
<th>Test</th>
<th>Description, translations, and/or normative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aachen Aphasia Test (Huber et al., 1983)</td>
<td>Multiple languages</td>
</tr>
<tr>
<td>Addenbrooke's Cognitive Examination (Mathuranath, Nestor, Berrios, Rakowicz, &amp; Hodges, 2000)</td>
<td>Adapted clock drawing tests in Spanish (García-Caballero, García-Lado, et al., 2006), as well as other languages (see García-Caballero, Recimil, et al., 2006)</td>
</tr>
<tr>
<td>Boston Diagnostic Aphasia Exam (Goodglass &amp; Kaplan, 1986)</td>
<td>Spanish (García-Albea, &amp; Sanchez-Bernados, 1986), and other language versions</td>
</tr>
<tr>
<td>Boston Naming Test (Kaplan, Goodglass, &amp; Weintraub, 1986)</td>
<td>Spanish version with normative data (Kohnert, Hernandez, &amp; Bates, 1998)</td>
</tr>
<tr>
<td>Clinical Evaluation of Language Fundamentals (Semel, Wiig, &amp; Secord, 1997)</td>
<td>Spanish version</td>
</tr>
<tr>
<td>Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001)</td>
<td>Spanish version with normative data</td>
</tr>
<tr>
<td>Consortium to Establish a Registry for Alzheimer’s Disease (Velasquez et al., 2000)</td>
<td>Spanish cognitive test battery</td>
</tr>
<tr>
<td>Mini-Mental State Examination (Folstein, Folstein, &amp; McHugh, 1975)</td>
<td>Spanish version with normative data (Reyes de Beaman et al., 2004), and additional language versions</td>
</tr>
<tr>
<td>Neuropsychological Screening Battery for Hispanics (Pontón et al., 1996)</td>
<td>Spanish cognitive test battery</td>
</tr>
<tr>
<td>Psycholinguistic Assessment of Language Processing in Aphasia (Kay et al., 1992)</td>
<td>Spanish version</td>
</tr>
<tr>
<td>Repeatable Battery for the Assessment of Neuropsychological Status (Randolph, 1998)</td>
<td>Spanish version</td>
</tr>
<tr>
<td>Rivermead Behavioral Memory Test (Wilson, Cockburn, &amp; Baddeley, 1985)</td>
<td>Chinese version (Wai-kwong Man &amp; Li, 2001)</td>
</tr>
<tr>
<td>Severe Impairment Battery (Saxton, McGonigle-Gibson, Swihart, Miller, &amp; Boller, 1990)</td>
<td>Available in several languages such as French, Italian, and Swedish (see Boller, Verny, Hugonot-Diener, &amp; Saxton, 2002)</td>
</tr>
<tr>
<td>Test of Everyday Attention (Robertson, Ward, Ridgeway, &amp; Nimmo-Smith, 1994)</td>
<td>Cantonese version (Chan, Hoosain, &amp; Lee, 2002)</td>
</tr>
<tr>
<td>Wechsler Adult Intelligence Scale (Wechsler, 1984)</td>
<td>Spanish version and other languages</td>
</tr>
<tr>
<td>Western Aphasia Battery—Spanish (Kertez et al., 1990).</td>
<td>Spanish version</td>
</tr>
<tr>
<td>Woodcock-Muñoz: Pruebas de aprovechamiento—Revisada (Woodcock &amp; Muñoz-Sandoval, 1996a)</td>
<td>Spanish test of academic skills for all ages through geriatric</td>
</tr>
<tr>
<td>Woodcock-Muñoz: Pruebas de habilidad cognitiva—Revisada (Woodcock &amp; Muñoz-Sandoval, 1996b)</td>
<td>Spanish cognitive test battery</td>
</tr>
</tbody>
</table>