Annual Review of Applied Linguistics (2013), **33**, 128–161.
© Cambridge University Press, 2013, 0267-1905/13 $16.00
doi: 10.1017/S026719051300010X

Language Disorders in Multilingual and Multicultural Populations

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We review the characteristics of developmental language disorders (primary language impairment, reading disorders, autism, Down syndrome) and acquired language disorders (aphasia, dementia, traumatic brain injury) among multilingual and multicultural individuals. We highlight the unique assessment and treatment considerations pertinent to this population, including, for example, concerns of language choice and availability of measures and of normative data in multiple languages. A summary of relevant, recent research studies is provided for each of the language disorders selected.

MULTILINGUALISM AND MULTICULTURALISM

In this article, we use the term *multilinguals* to refer to individuals who use more than one language. That is, we include in this term bilingual individuals—those who use two languages—as well as those who use more than two languages (trilinguals, quadrilinguals, etc.). We note, however, that there is evidence suggesting that the learning and using of a third and fourth language may be different from learning and using a second language; for example, bilinguals learning a third language (L3) may outperform monolinguals learning the same language as a second language (e.g., Cenoz, Hufeisen, & Jessner, 2003; Lanza & Svendsen, 2007).

Furthermore, we employ a broad definition of multilinguals in terms of language proficiency. That is, we do not constrain the term *multilinguals* to those individuals who have high and comparable proficiency in both (or all) their languages; rather, all individuals whose proficiency level allows them to use the language in communicative situations are considered multilinguals, even if their proficiency in one language is far superior to that of their other language(s). Thus multilinguals who acquired their languages from early childhood as well as those who learned their non-L1 (nonfirst language) later in life are considered here (e.g., Kohnert, 2008). When relevant, we state whether we are discussing balanced or dominant multilinguals as well as simultaneous versus early or late sequential multilinguals. Finally, individuals who use more than one language typically belong to—or at least are highly familiar with—more than one culture,

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and thus can be also considered multicultural. Cultural considerations are critical to the assessment and intervention of multilingual individuals and will be considered here as appropriate. It is clear, therefore, that the target population discussed in this article is highly heterogeneous.

ASSESSMENT OF MULTILINGUAL AND MULTICULTURAL INDIVIDUALS

Speech-language pathologists (SLPs) employ a variety of tools to assess linguistic and communicative skills of individuals with a developmental or acquired language disorder. These tools comprise informal methods (such as observation, engaging in spontaneous conversation, and interviewing the communication partners of the appraised individual) and formal measures (such as published, standardized measures as well as experimental tests). Most standardized tests available for SLPs are monolingual tests. Many of these measures were developed in English, and normative data have been collected from monolingual, native speakers of English. For example, the Clinical Evaluation of Language Fundamentals (CELF-4; Semel, Wiig, & Secord, 2004) and the Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007) are used to assess language abilities in children and adolescents; the Boston Diagnostic Aphasia Examination (BDAE-3; Goodglass, Kaplan, & Barresi, 2001) and the Western Aphasia Battery (WAB; Kertesz, 1982) are used to assess language abilities in individuals with aphasia (an acquired language disorder resulting typically from acute-onset brain damage) and to determine aphasia type.

Other tests have been developed and normed with monolingual individuals of languages other than English. For example, the Aachen Aphasia Test (AAT; Huber, Poeck, & Willmes, 1984) was developed and normed in German. Many tests have been adapted to speakers of other languages (e.g., the WAB into Spanish and Thai; the CELF and PPVT into Spanish; the Psycholinguistic Assessments of Language Processing in Aphasia [PALPA; Kay, Lesser, & Coltheart, 1992] into Spanish and Hebrew), but have typically been normed, if at all, with monolingual speakers of that language. Several exceptions include the Bilingual Aphasia Test (M. Paradis & Libben, 1987), designed to assess aphasia in numerous languages and specifically in multilingual individuals, and the forthcoming Bilingual English Spanish Assessment (BESA; Peña, Gutérrez-Clellen, Iglesias, Goldstein, & Bedore, manuscript in preparation), which takes into account language proficiency. Casas, Calamia, and Tranel (2008) developed a naming test, appropriate specifically for bilinguals, by selecting 51 items that were deemed appropriate to a population of Spanish-English bilinguals out of 299 items administered to 67 bilingual healthy adults.

Few standardized tests used by SLPs provide normative data from multilingual individuals. Furthermore, even if such normative data exist, given the heterogeneity of the multilingual population at hand, it would be difficult to find a normative group that matches the person to be appraised in the specific language pair, the relative proficiency in each of the languages, and the history (age, manner) of learning each language. When tests are adapted to another language, certain considerations are warranted. If stimulus characteristics, such

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as frequency, length, and presence of foils (e.g., phonologically similar words), play a role in the structure of the test, these need to be adapted to the target language amid cross-language differences. Items on the test may not be applicable or appropriate across cultures and therefore may need to be replaced (e.g., *wreath* and *pretzel* on the Boston Naming Test in the BDAE). Furthermore, the level of difficulty of the resulting adapted test may not be identical to that of the original test. It has been argued that to obtain an accurate picture of the appraised individuals, all their languages should be tested (e.g., Goldstein, 2000; Kohnert, 2008). Thus the comparability of the tests in different languages is important.

Also important are decisions concerning the person administering the test. Should monolingual examiners test each of the multilinguals' languages, or is it best to have a multilingual examiner, ideally from the same community, test in all languages to be appraised? Similarly, decisions about acceptability of language mixing and switching during the testing sessions and consequent decisions about scoring (e.g., of correct responses in the nontested language) need to be made in accordance with the goal of testing and the circumstances. Testing multilinguals in a multilingual context is likely to yield different results than testing a multilingual in a monolingual context. Moreover, differences in performance may be related to whether the less-proficient language is the language of the majority in the social context of the multilingual individual or a minority language. A related issue is the level of acculturation of speakers of minority languages to the culture of the majority group (see Battle, 2002; Kohnert, 2008). For example, bias in testing tools and interpretation, including expected and accepted answers, and effects of the testing situation may result from inaccurate assumptions about biculturalism (Battle & Anderson, 1998). The multitude of such variables may contribute to inconsistent results in published studies about multilinguals with language disorders, as will be reviewed below.

INTERVENTION WITH MULTILINGUAL AND MULTICULTURAL INDIVIDUALS

SLPs are charged with providing intervention, which aims at improving the language and communication abilities of individuals with developed or acquired impairment. Numerous methods, techniques, and approaches have been developed to maximize the efficacy of the intervention. SLP intervention can target two different processes of rehabilitation: recovery, that is, the restoration of functions and abilities; and compensation, that is, performing functions and abilities in new manners (e.g., Kleim, 2011). A subset of these therapeutic tools has received support from research studies (e.g., Frymark, Venediktov, & Wang, 2010; Gerber, Brice, Capone, Fujiki, & Timler, 2012). The large majority of these techniques has been developed, employed, and studied with monolingual individuals.

To date, there are research studies demonstrating that administering therapy in one language can affect the nontreated languages of the multilingual individual with acquired language and communication disorders, as reviewed in the next sections of this article (e.g., Faroqi-Shah, Frymark, Mullen, & Wang, 2010); limited

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data are available for cross-language treatment generalization in children with developmental communication disorders (e.g., Abu-Rabia & Bluestein-Danon, 2012; Ebert, Kohnert, Pham, Disher, & Payesteh, in press). In treatment, as in assessment, certain adaptations and decisions must be considered when the person receiving the intervention is a multilingual. These include the choice of therapist—a monolingual versus multilingual clinician—and the choice of the language of therapy, a decision that depends on the relative strength of each language, the sociolinguistic context, and the preference of the treated individual. Additional choices concern the inclusion of materials sensitive to the culture of the treated individuals and whether each treatment session should be limited to one language or will allow for code-switching. All of these variables have the potential of affecting the results of the intervention.

The following sections review recent research in four types of developmental language disorders and three of acquired language disorders.

DEVELOPMENTAL LANGUAGE DISORDERS

Primary Language Impairment (PLI)

Primary language impairment (PLI), also known as specific language impairment (SLI),[1] is a disorder of language development in children that is not due to hearing, visual, neurological, or motor impairment (Kohnert, 2010; Leonard, 1998; Rice, 2004) and affects about 7% of the population (Tomblin et al., 1997). This primary impairment of language learning predominantly disrupts the development of grammatical morphology relative to other aspects of language, although lexical, semantic, and pragmatic difficulties have also been observed.[2] Hallmark characteristics include difficulty with morphosyntax and the acquisition of functional categories, such as tense and inflection (Bedore & Leonard, 2005; Bedore & Peña, 2008; Jacobson, 2012; J. Paradis & Crago, 2001), as well as more complex syntactic rules such as those involving syntactic movement and thematic relations (e.g., van der Lely, 2005). The origin of PLI is highly debated, whether specific to the linguistic domain or more generally attributable to the cognitive-perceptual domain; however, there is general consensus among researchers that the disorder is neurodevelopmental (J. Paradis, 2010a; Rice, 2012). By and large, children with PLI begin to speak later than their typically developing (TLD) peers and demonstrate difficulty in processing and, to a greater extent, in production of their language(s) (Leonard, 1998; Peña & Bedore, 2009). As such, children with PLI are at high risk for concomitant academic and social-emotional difficulties; thus early identification and intervention are crucial (Leonard, 1998; Schwartz, 2009).

In children who speak two or more languages, assessment and diagnosis of PLI is confounded by two key issues: the heterogeneity of multilingual development and the language-specific characteristics of PLI (J. Paradis, 2010b). First, among multilinguals there is a wide range of achievement in reaching so-called typical developmental milestones in each language for a given age. Variables such as frequency and type of language input, language status, age, and pattern

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of exposure (simultaneous vs. sequential) can affect children's performance in their languages (J. Paradis, 2010a). Separating typical from atypical language performance in multilinguals is therefore inherently complex, as there is a certain amount of overlap in the errors (e.g., article use) produced by multilingual children with and without PLI, which can make differential diagnosis tenuous (e.g., Anderson & Marquez, 2009). Second, how PLI manifests in the developing language learner is dependent upon the properties of a given language and the age of the child. For example, tense-marking morphemes are characteristically problematic for young monolingual children with PLI in English (e.g., Rice, Wexler, Marquis, & Hershberger, 2000), but not in Spanish (Bedore & Leonard, 2001). Moreover, similar to the influence of cross-language transfer in second language (L2) learning in TLD, cross-linguistic influences unique to a particular language pairing can affect the pattern of errors observed in L2 learners with PLI (e.g., Leonard, 2009; J. Paradis, 2010a; Verhoeven, Steenge, & van Balkom, 2012). As a consequence, the linguistic characteristics of multilingual children with PLI may differ from those of monolingual children with PLI (Orgassa & Weerman, 2008; Verhoeven, Steenge, van Weerdenburg, & van Balkom, 2011).

An in-depth look at skills in all languages informs the process of assessment of multilingual children with PLI.[3] Research suggests that a valid diagnostic evaluation should include three key elements. First, in addition to any available standardized testing with multilingual norms, data should be collected from a variety of sources including parent report (J. Paradis, Emmerzael, & Duncan, 2010), curriculum-based language assessment, and language sampling (Caesar, 2005; DeLamo, White, & Jin, 2011). Second, language proficiency should be evaluated for both native and classroom languages in a comprehensive nonbiased assessment that includes measures of language dominance and language proficiency (Caesar, 2005; Caesar & Kohler, 2007). Third, the vulnerabilities of each language in multilingual children with PLI may be evident on some tasks and not others; thus a variety of tasks, dynamic as well as static measures, increases the likelihood that the results are representative of the child's current skill level (Bedore et al., 2012; Caroline & Jin, 2011; Kohnert, 2010; Thordardottir, 2008; Verhoeven et al., 2011).

Dynamic assessment is a promising tool for differentiating multilingual children with PLI from TLD. Static assessment examines a child's current linguistic skills, which, in multilingual children with PLI, fall within a wide range of performance. Dynamic assessment measures the rate of change in performance and may provide information about learning strategies, need for prompting or repetition, and insight into children's language-learning difficulties. A recent study suggests that dynamic assessment of word learning in both languages of a bilingual is likely to better identify the relative strength of a child's fast mapping skills as well as potential cross-linguistic transfer (Kan & Kohnert, 2012; see also Hasson, Camilleri, Jones, Smith, & Dodd, 2013; Kapantzoglou, Restrepo, & Thompson, 2012). In addition, the inclusion of information about the learning process (e.g., children with PLI may attend to different features of words) may lead to better identification of multilingual children with PLI (Alt & Suddarth, 2012).

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Another interesting alternative to differential diagnosis of multilingual children with PLI is the use of code-switching. Iluz-Cohen and Walters (2012) used a clever, culturally sensitive design to elicit code-switching in children with and without PLI. The children were asked to retell a story in three different sociolinguistic settings: (home) a story told in English to a Hebrew-speaking monolingual puppet, (school) a story told in Hebrew to an English-speaking monolingual puppet, and (doctor's office) a story told bilingually to a bilingual puppet. On the retelling, the group with PLI code-switched more frequently and had longer segments of code-switched speech. In addition, the group with PLI code-switched twice as frequently from L2 to L1 than from L1 to L2, whereas the TLD children code-switched in either direction equally.

An additional aspect of assessment of children with PLI concerns the role of cognitive weaknesses (such as limited working memory, processing speed, attention, and task shifting) in language acquisition (e.g., Leonard et al., 2007; Tropper, 2009; Windsor, Kohnert, Loxtercamp, & Kan, 2008). Given the heavy demands on information processing that language learning entails, specific cognitive difficulties can interact with the acquisition of language-specific linguistic structures, such as low salience grammatical morphemes (Hayiou-Thomas, Bishop, & Plunkett, 2004). It is unclear to what extent cognitive impairments underlie deficient language acquisition in PLI generally and in multilingual children specifically. At the same time, recent studies on the potential cognitive advantage of multilinguals would predict that multilingual children with PLI could fare better than their monolingual peers (e.g., Bialystok, Craik, & Luk, 2012).

The research on effective interventions for multilingual children with PLI is sparse. A frequent question is which language should be used for remediation purposes. Recent intervention studies with this population suggest that therapy in L1 can facilitate development of L2, and that gains in L2 following bilingual intervention are comparable to those following treatment in L2 alone (Ebert et al., in press; Restrepo, Morgan, & Thompson, 2013; Gutiérrez-Clellen, Simon-Cereijido, & Sweet, 2012). Ebert et al. compared the efficacy of four treatment conditions administered to bilingual school-aged children with PLI: language treatment in English-only (L2), bilingual treatment (80% Spanish and 20% English), a nonlinguistic-cognitive treatment, and a deferred treatment condition. The children received language intervention targeting skills in auditory comprehension, morphosyntax, and vocabulary for approximately four sessions a week for 6 weeks. The treatment in L2 English resulted in minimal gains in Spanish L1, but bilingual treatment with an emphasis on L1 Spanish resulted in significant gains in English, equivalent to the gains in English made by the English-only group. These results are consistent with those of Restrepo et al. (2013), who found comparable gains in English vocabulary between their English-only and bilingual treatment groups in preschool children with PLI. Moreover, Gutierrez-Clellen and colleagues noted that preschool English language learners with PLI who were the most limited in the development of their L1 benefitted more from bilingual than from L2-only instruction (Gutiérrez-Clellen et al., 2012).

Decisions about the language of treatment should be based on the individual cultural and linguistic needs of the child. Support for the stronger language or multilingual support may be initially necessary, but the language needs of the

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child may change based on the demands of home and school (Thordardottir, 2010). These recommendations are, however, problematic for the monolingual clinician who may be the only one available to treat the child. One creative alternative, a computer-interfaced program in Vietnamese and English, was investigated by Pham, Kohnert, and Mann (2011). The program, administered by a monolingual English-speaking clinician, resulted in significant receptive vocabulary improvement in both languages for a bilingual preschooler. Additional evidence about the efficacy of intervention in one or more languages in children with PLI and the variables that may affect the degree of cross-language influences will contribute to successful clinical decisions.

Reading Disorders

The incidence of reading impairment among English-speakers has been estimated from 5% to as much as 20% (J. Paradis, Genesee, & Crago, 2011; Shaywitz, 2003) and its prevalence among speakers of other languages is influenced by cross-linguistic differences (Wydell, 2012). The origin of the reading disorder in a biliterate will influence whether reading is similarly or differentially affected in the two languages. Children who have (classic) dyslexia experience difficulty with decoding words or characters. They have poor decoding skills for reading and poor encoding skills for spelling in the absence of significant verbal language difficulties. Their inordinate difficulty with reading and spelling is not due to limitations of cognition, reading instruction, or sensory/motor abilities (Bishop & Snowling, 2004; Lyon, Shaywitz, & Shaywitz, 2003). The reading problems of multilingual children with dyslexia may therefore be language specific, and the severity of the problem will be influenced by the characteristics of each orthographic system. In contrast, reading difficulties can stem from underlying problems, such as reduced vocabulary, listening comprehension, and working memory, associated, for example, with primary language impairment (PLI)[4] or with a separate disorder, hyperlexia (precocious decoding skills markedly superior to reading comprehension; e.g., Kennedy, 2003; Grigorenko, Klin, & Volkmar, 2003). In those cases, the reading problems may be more general, reflective of verbal language difficulties in the two languages (Joshi, Padakannaya, & Nishanimath, 2010; Nation, 2008; J. Paradis et al., 2011).[5] Children who have challenges with both decoding and comprehension will struggle with reading in both of their languages, and the weight of each component may shift dependent upon the relative development of phonological, morphological, and other linguistic skills. These children often fall under the diagnostic umbrella of language-learning disabled.

A principal focus of research on reading disorders in multilinguals has been on mutual and differential symptoms of impairment subject to the orthographic characteristics of the languages and their relative orthographic distance. Although decoding or character recognition is the gateway to reading comprehension, researchers now recognize the important role morphology plays in reading for this population (e.g., Apel & Lawrence, 2011). The strategies that readers with and without dyslexia initially use and later establish depend, in part, upon the characteristics of a given orthography. A principal interest has been how the

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correspondence between the phonological unit and its symbol bears on reading development across languages. Recent investigations highlight key factors to consider when diagnosing and remediating reading disorders in the biscriptal reader.

Writing systems may be described along three continua: two correspondence continua (granularity and transparency) and one accessibility (availability) continuum. Learning to read is influenced by all three continua, as explained by the psycholinguistic grain size hypothesis (PGSH; Ziegler & Goswami, 2005). The first, granularity, refers to the size of the speech unit that is depicted by script, be it a word, syllable, or phoneme. Each writing system is generally categorized along the continuum from coarse (logographic) to moderate (syllabic) to fine (alphabetic).[6] The second, transparency, refers to the consistency of the correspondence between speech units and script. Finnish, for example, has a consistent letter-sound correspondence and is highly transparent, whereas English has marked inconsistency between letters and sounds and is considered opaque. The third, a reader-dependent continuum, is the accessibility or the saliency of the phonological unit to the reader. For example, words would be the most salient and accessible speech units to a beginning reader, while individual phonemes within a word would be markedly less accessible, making coarser orthographies potentially easier. The more transparent orthographies are also more accessible and easier for readers to learn, as well as less problematic for individuals with dyslexia (Wimmer, 1993; Ziegler & Goswami, 2005; Zoccolotti, De Luca, Di Pace, Judica, & Orlandi, 1999).

One resulting problem for cross-linguistic comparisons among populations is that diagnostic measures for identifying dyslexia or other reading disabilities vary depending on the orthography (Landerl et al., 2013; Wydell, 2012). For example, in more transparent orthographies, dyslexia is manifested by reduced reading rate (Oren & Breznitz, 2005; Suárez-Coalla & Cuetos, 2012), while reduced accuracy is distinctive in opaque orthographies (e.g., Goulandris, 2003; Katzir, Shaul, Breznitz, & Wolf, 2004; Ziegler & Goswami, 2005). Likewise for the granularity continuum, phonological awareness is closely tied to decoding and word recognition in alphabetic languages (e.g., Melby-Lervåg, Lyster, & Hulme, 2012; cf. Duncan, 2010), and cross-language transfer of phonological awareness has been demonstrated in alphabetic scripts (e.g., Durgunoğlu, Nagy, & Hancin-Bhatt, 1993), whereas morphological awareness appears to be important for logographic scripts (e.g., Chung & Ho, 2010; Wu, Packard, & Shu, 2009). Thus, although the defining characteristic is difficulty in reading, there is a need to consider criteria unique to each language when comparing groups with dyslexia across languages. As an alternative, neurobiological markers have been discussed in the diagnosis literature (Rezaie, Simos, Fletcher, Denton, & Papanicolaou, 2012). At the present time, however, the subject of debate is whether dyslexia has a common neurological basis irrespective of the orthography (e.g., Paulesu et al., 2001; Paulesu, Brunswick, & Paganelli, 2010) or different underlying brain abnormalities (e.g., Hadzibeganovic et al., 2010).

When assessing biscriptal readers, it is important to differentiate reading difficulties in an L2 that may be due to language-proficiency differences from those that are the consequence of dyslexia or other reading disorders (Nijakowska,

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2011). The inclusion of dual-language measures of phonological and morphological awareness, nonword and word reading, oral reading rate, reading comprehension measures, spelling, and rapid naming is essential because dyslexia can manifest differently depending on the orthographic system. Within-subject comparisons allow cross-linguistic investigation of biscriptal readers and uniform selection criteria for the study participants. Lindgrén and Laine (2011a, b) compared Finnish-Swedish-English trilingual university students with and without dyslexia on reading and writing measures to examine how orthographic depth influences reading problems across scripts. Of the three, Finnish has the most transparent orthography, followed by Swedish, which in turn is less opaque than English. The students with dyslexia and the control group did not differ in comprehension but did differ in accuracy on oral reading in the three languages. Interestingly, the reading rate for the readers with dyslexia increased as transparency increased. Lindgrén and Laine (2011b) suggested that the absence of reduced rate for these readers in Finnish, the most transparent, may be due to a sacrifice of accuracy for rate. Similarly, Ibrahim and colleagues (e.g., Ibrahim, Eviatar, & Aharon-Peretz, 2007) hypothesized that visual complexity and orthographic transparency affect the process of reading acquisition, providing evidence from children learning to read multiple scripts, such as Arabic and Hebrew versus Russian and Hebrew.

Differential impairment in biscriptal readers with dyslexia helps identify language-specific and language-general processes of reading. Joshi et al. (2010) compared two Kannada-English bilinguals with reading disorders, one with dyslexia and one with hyperlexia, to a group of typical biscriptal readers. Kannada, a Dravidian language spoken in south India, is an alphasyllabary and is highly transparent. The PGSH would predict better reading performance for the participant with dyslexia in Kannada than in the opaque orthography of English, a prediction that appeared to be partially supported by the data. Although he had difficulty reading nonwords in both languages with no apparent advantage for decoding Kannada, the participant with dyslexia did have a higher percentage of word recognition errors in English than in Kannada, due principally to poor irregular word reading. In contrast, the participant with hyperlexia had good decoding skills in his languages but reduced reading comprehension in both languages, as well as concomitant difficulty with listening comprehension.

The simple view of reading (SVR) elucidates the independent but equally important contributions linguistic comprehension and decoding make to the reading process (Catts, Hogan, & Fey, 2003; Gough & Tunmer, 1986; Hoover & Gough, 1990). This model helps explain individual differences in reading ability due to weaknesses in one or both of the skills (Kirby & Savage, 2008; Vellutino, Tunmer, Jaccard, & Chen, 2007). However, the SVR does not address additional aspects potentially problematic for reading-disabled readers, such as naming speed or general processing speed (Gustafson, Samuelsson, Johansson, & Wallmann, 2013; Johnston & Kirby, 2006; Ouellette & Beers 2010; Tunmer & Chapman, 2012). Nevertheless the SVR model has served to clarify the functions of language comprehension and decoding in developing readers across orthographies (Joshi, Tao, Aaron, & Quiroz, 2012) as well as the contributions of each in readers with disabilities (Joshi et al., 2010).[7]

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Just as phonological awareness is considered important for decoding and word recognition in alphabetic languages, morphological awareness is linked to word recognition in logographic orthographies such as Chinese (McBride-Chang et al., 2011; Shu, Wu, McBride-Chang, & Liu, 2006; Wu et al., 2009). In sequential Chinese-English bilingual readers, problems with morphological awareness have been found in poor readers in Chinese (McBride-Chang, Liu, Wong, Wong, & Shu, 2012) and in both Chinese and English when assessed independently (Chung & Ho, 2010). In addition, morphological awareness has been shown to influence both word recognition and reading comprehension in alphabetic languages, particularly in the higher elementary grades when vocabulary increases in morphological complexity (see Carlisle, McBride-Chang, Nagy, & Nunes, 2010; Tong, Deacon, Kirby, Cain, & Parrila, 2011). Consistently, children with PLI have a high risk of reading problems—with an incidence of over 50% versus 8.6% in typically developing children—due to difficulties with grammatical morphology and language comprehension (Catts & Hogan, 2003; Catts, Fey, Tomblin, & Zhang, 2002). Morphological intervention has proven effective for a range of students with literacy difficulties, including children with language-learning disabilities, struggling readers, and English language learners (Goodwin & Ahn, 2010).

A relationship between morphological awareness and reading comprehension has been observed for typical readers in languages with dissimilar scripts such as Arabic (Mahfoudhi, Elbeheri, Al-Rashidi, & Everatt, 2010), Spanish (Kieffer & Lesaux, 2008), Chinese (Lam, Chen, Geva, Luo, & Li, 2012), and Korean-English readers in both languages (Wang, Ko, & Choi, 2009). For struggling readers, poor morphological awareness has been linked to poor reading comprehension (e.g., Goodwin & Ahn, 2010; Schiff, Schwartz-Nahshon, & Nagar, 2011), as well as an inability to use morphological awareness to bolster reading comprehension (Mahfoudhi et al., 2010). However, in biscriptal readers the morphological feature that transfers and the direction of transfer is dependent upon the similarities of morphological characteristics between the languages (Pasquarella Chen, Lam, Luo, & Ramirez, 2011). For example, Pasquarella et al. (2011) found that an awareness of compound words in English appeared to facilitate Chinese word reading in Chinese-English typical readers, likely, the authors suggest, because compound words are an important part of Chinese vocabulary and are similarly formed in the two languages. In contrast, awareness of English derivational morphology was not related to Chinese vocabulary, as Chinese has few derived words.

The limited findings available to date from studies in biscriptal readers with reading disorders suggest that cross-linguistic transfer following reading intervention can occur in either direction (Swanson, Hodson, & Schommer-Aikins, 2005; Vaughn et al., 2006); however, the nature of this transfer is not well defined. In a recent study Abu-Rabia and Bluestein-Danon (2012) gave 20 sixth-grade Hebrew-English poor readers 40 hours of intervention over a 5-month period in their L2 (English) and assessed their reading skills in both their languages pre- and postintervention. The authors noted improvements in the children's phonological, morphological and syntactic awareness, reading fluency, and nonword reading in both languages, suggesting cross-linguistic L2 to L1 transfer; whereas orthographic-specific skills showed improvement only in L2-English,

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the language of instruction. Reading intervention studies for multilingual poor readers are needed, including those with better controls, larger sample sizes, different language pairings, and a variety of intervention methods.

Autism

Autism spectrum disorder (ASD) refers to a heterogeneous group of developmental disorders with deficits in verbal and nonverbal communication and restricted or repetitive patterns of behavior in the absence of a general developmental delay (*Diagnostic and Statistical Manual of Mental Disorders, 4th ed., text rev.; DSM-IV-TR*; American Psychiatric Association, 2000). Although speech and language assessment for children with a diagnosis of ASD will reveal a range of severity of communication impairment, generally children with ASD have marked difficulty with social pragmatic skills and language learning (Gerenser, 2009). Given these limitations in communication, parents and professionals have expressed concern about whether it is prudent to expose a child with autism to multiple languages. Indeed, parents have been told that multiple languages will confuse the child or even that the child's problems are caused by the multilingual input (Jegatheesan, 2011). Few studies, however, have investigated the outcomes of multilingualism on the language development in children with ASD or the consequences of limiting family interchanges to one language for these children, particularly if family members are not fluent in the selected language. Three recent studies have compared the communication skills in children with ASD exposed to one language versus those exposed to two or more languages and found no evidence for a negative effect of multilingualism; and in one study, some important advantages were found.

Petersen, Marinova-Todd, and Mirenda (2012) examined the language skills of 14 bilingual (Cantonese- or Mandarin- and English-exposed) and 14 monolingual (English-exposed) children with ASD, age 43–73 months, who spoke a minimum of 30 words. After controlling for the effects of therapy and nonverbal IQ, the two groups did not differ on the receptive or expressive language measures administered in English (or parallel measures in Chinese), suggesting no disadvantage for the children in bilingual homes. Taking bilingual exposure a step further, Hambly and Fombonne (2012) looked at the timing of language exposure by testing 75 children (age 36–78 months) divided into three groups: two groups of bilingual-exposed children (one simultaneous [before 12 months of age] group and one sequential [after 12 months] group) and a monolingual group. The three groups performed similarly on the (dominant) language measures, suggesting that bilingualism did not disadvantage the language development of these children with autism, nor did the timing of the (L2) exposure. Similarly, Ohashi et al. (2012) found no negative effect of bilingualism when they compared the language abilities of English-French bilingual children who had been recently diagnosed with autism with typical bilingual learners and English-exposed monolinguals with autism matched by IQ. The assessments were conducted in the (dominant) home language. With the effects of any previous intervention hours co-varied, the groups did not differ on any of the language measures of receptive, expressive, or functional communication skills. These results also suggested no

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language-learning disadvantage for the bilingual children with ASD, even prior to substantial intervention.

The results of these studies thus do not support the recommendation, often made by professionals, to limit input to the child with ASD to one language (Kay-Raining Bird, Lamond, & Holden, 2012; Kremer-Sadlik, 2005). Moreover, parents prefer raising their children multilingual regardless of their impairments. In her investigation, Jegatheesan (2011) reported that parents were counseled by teachers and professionals to speak only one language to their children—English. (This contradicts the formal recommendation by the International Association of Logopedics and Phoniatrics [IALP] that the home language should not be changed; Fredman & Centeno, 2006). The families considered the request unreasonable because many family members were not fluent in English, and following the professionals' recommendations would have essentially cut the child off from family life. Therefore, the parents hid their child's multilingual exposure from the professionals in charge of their child's education. Of note, by the end of the interview project, the children had made significant progress: The author and families observed a marked reduction in tantrums and all three boys were conversing in three languages.

Furthermore, Jegatheesan (2011) carefully explored the cultural and individual issues underlying the decision of three South Asian Muslim families who had immigrated to the United States to raise their child with ASD as multilingual. Using ethnographic interviews, observations, and fieldwork over a period of 17 months, Jegatheesan investigated the families' cultural practices and the parents' beliefs about multiple language acquisition. According to the study, the families' beliefs were shaped by their Islamic faith, which emphasized full inclusion of children with disabilities in all family and community activities to enable them to overcome their limitations. An essential part of family life was interacting with family and friends, most of whom were multilingual and freely code-switched. The children's exposure to all languages was considered important for participation in family events and other religious and community activities, and learning and praying in Arabic was central to their Muslim identity and religious practices. As well, the families wanted their children to speak in English to be able to interact in the school and community. One parent, concerned about her son's disruptive behavior and need to practice English, talked about taking her son to the stores late at night when there were fewer people so she could teach him to talk to the staff in English and the staff might have more time to respond.

Kay-Raining Bird et al. (2012) surveyed 49 parents of children with ASD who were members of a multilingual family, of which 75% were raising their children to be multilingual.[8] These parents selected reasons for raising their children with ASD bilingually: communication with family and friends, living in a bilingual city or country, and the life and job opportunities that would be available to them. Concerns that were expressed by those who had decided to maintain a multilingual home included the lack of professional help and/or access to services, the lack of support from family and friends, and the worry that the child would be confused or find learning languages too difficult. Interestingly, of these parents, 97% of the respondents providing bilingual input to their child

https://doi.org/10.1017/S026719051300010X Published online by Cambridge University Press

and 89% of those providing monolingual input considered becoming bilingual for their child with ASD equally or more important as for their sons or daughters who were typically developing.

In sum, the evidence suggests that exposing a child with ASD to multiple languages does not hamper language development, and instead fosters the child's ability to communicate with immediate and extended family members. Moreover, training is sorely needed to ensure that professionals make culturally sensitive recommendations based on empirical evidence.

Down Syndrome

Down syndrome (DS) is a genetic condition caused by a mutation in cell division (Trisomy 21) resulting in a developmental phenotype that includes mental retardation and speech and language delay, among many other difficulties. The incidence of concomitant hearing loss, commonly conductive, is high (34%) in the critical first year of life (Raut et al., 2011) and is often an ongoing problem. Rate of speech and language development seems to parallel nonverbal cognitive development initially, though a gap between communication and cognitive skills soon emerges that widens over time, with progressively more advanced nonverbal skills (Chapman & Hesketh, 2001). Yet the weaknesses in verbal development are not uniform. Speech intelligibility difficulties are often evident, receptive skills surpass expressive, and vocabulary knowledge is characteristically stronger relative to compromised morphosyntactic skills (Chapman, 2006; Dodd & Thompson, 2001).

Few studies published to date have looked at the effect of multilingual input on children with DS. Kay-Raining Bird and colleagues (Kay-Raining Bird, 2009; Kay-Raining Bird et al., 2005) compared children who were bilingual and monolingual with DS to those who were typically developing and matched for developmental level. Similar to prior studies, the children with DS showed evidence of an expressive language weakness relative to the TLD children. Critically, the bilingual and monolingual groups with DS did not differ on any of the language measures including receptive and productive vocabulary, MLU (mean length of utterance), and number of different words, implying no inherent bilingual disadvantage for language learning in children with DS. The authors noted a considerable range of performance in the less dominant language among the bilingual children with DS; in a subsequent study, Feltmate and Kay-Raining Bird (2008) investigated whether some children with DS had more difficulty than others in learning a second language, accounting for this wide performance range. From an in-depth look at the morphosyntactic and vocabulary skills of four English-French bilingual children with DS matched in triads, each with a monolingual child with DS and a developmental-matched bilingual TLD, the investigators noted that a receptive-expressive performance differential was present to a similar degree in both English and French. In addition, the individual differences in relative dominance and L2 production observed for the children with DS appeared to be related to the exposure time to the L2. Although the children with DS performed better on receptive than expressive skills overall, three of the four DS bilingual children demonstrated English dominance in expressive but not receptive vocabulary.

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Notably, some of these bilingual children with DS outperformed their TLD peers on a few of the expressive measures, demonstrating the ability not only to acquire two languages, but also to do so in an area of relative weakness.

Bilingualism across modalities was investigated in a set of monozygotic twins with Mosaic DS at 10 years of age and again at 16 years of age (Woll & Grove, 1996; Woll & Morgan, 2012). The parents were both deaf and members of the deaf community. The twins, simultaneous bilinguals, communicated with their parents in British Sign Language (BSL), with the hearing community in English (including an older brother), and between themselves in both, although they used English exclusively if no deaf individuals were present. The girls differed in the extent of their language deficits, but their patterns of difficulties were consistent across languages. For both girls, their BSL and English receptive skills were stronger than expressive skills, and they tended to score higher in BSL than English vocabulary comprehension at 10 years of age. The sign language advantage was even more pronounced at 16 years of age (Woll & Morgan, 2012).[9] The morphosyntactic weakness reported for monolingual children with DS was similarly noted in the twins' languages and they demonstrated greater difficulty in both BSL and English as morphosyntactic complexity increased.

If bilingualism poses no inherent disadvantage for children with DS, does multilingual input confer an advantage? Are the cognitive benefits of bilingualism that have been suggested for TLD individuals (Bialystok & Martin, 2004; Bialystok & Viswanathan, 2009) applicable to individuals with DS? Edgin, Kumar, Spanò, and Nadel (2011) looked at the neuropsychological performance of 41 individuals, ages 7 to 18, with DS. Two groups with equivalent age, gender, IQ, and socioeconomic status were compared, a monolingual ($n = 28$) group and a bilingual ($n = 13$) group, with the latter exposed to a second language between 1 and 11 hours daily. On testing, which included the Arizona Cognitive Test Battery for DS, Kaufman Brief Intelligence Test—Second Edition (KBIT-II), Behavior Rating Inventory of Executive Function (BRIEF), and the Scales of Independent Behavior—Revised (SIB-R), no significant group differences were found. Although the bilingual and monolingual groups did not differ, suggesting no cognitive advantage for the bilingual group, the study had limitations, some of which were recognized by the authors. Additional language testing beyond that of a parent rating scale (SIB-R), particularly in the less dominant language, would be needed to adequately assess receptive and expressive skills. In addition to daily hours of exposure, other factors should be considered that have been shown to influence language learning, such as the type of input, language status, and the onset of exposure (sequential or simultaneous). It is also possible that the age range in this study was too wide to examine equitably the potential differences. The so-called cognitive advantage of bilingualism also appears to change across the life span (Bialystok, Martin, & Viswanathan, 2005). Bilingual children and older adults show a cognitive advantage that young adults may not (Bialystok, Craik, & Luk, 2008, 2012; Salvatierra & Rosselli, 2011).

To conclude, current findings suggest that children with DS can learn multiple languages without negative effects on their dominant or overall communicative abilities. The research on bilingualism and DS has been limited, however, and variability has been found in these children's L2 performance. Feltmate and

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Kay-Raining Bird (2008) suggested that children with DS may need more repetition and structured input for effective language learning. The efficacy of bilingual intervention in these children has yet to be explored. Whether or not bilingualism confers a cognitive advantage for people with DS warrants our attention. The potential for enhancing learning during the formative years as well as improving cognitive reserve in individuals with DS who are at greater risk than the general population for acquiring dementia in their elder years (Tyrrell et al., 2001) is a worthy rationale.

ACQUIRED LANGUAGE DISORDERS

Aphasia

Aphasia is an acquired disorder of language and communication, resulting from brain damage. Aphasia is caused most often by a cerebral-vascular accident (stroke) in the language-dominant hemisphere of the brain (the left hemisphere in most individuals). Aphasia and related acquired language and communication disorders can also result from closed-head injury, brain tumors, and progressive neurological diseases, as will be discussed below. The disorder can affect all language modalities or selective ones and can range from mild to severe. The extent and the specific characteristics of the impairment are associated with the site and size of the brain lesion. When the lesion is small and the subsequent impairment is mild, complete recovery is, in some cases, attainable; however, most individuals with aphasia do not recover their linguistic and communication skills completely or return to their pre-onset level of functioning. In most cases, gradual improvement continues with time and treatment.

Many multilingual individuals who sustain a single stroke resulting in aphasia experience comparable—or parallel—impairment in all languages (Fabbro, 2001; M. Paradis, 2004). That is, if they were highly proficient in all their languages prior to the stroke, they show comparable degree of difficulty in all their languages poststroke. Less often, but not infrequently, there is nonparallel pattern of impairment and recovery, when the relative impairment of the languages poststroke does not reflect their relative strength prior to the aphasia onset. For example, one language is accessible more than others, despite comparable proficiency prior to the stroke, or some languages appear completely inaccessible to the speaker poststroke (Albert & Obler, 1978; M. Paradis, 1983).

Variables, such as age of acquisition, levels of proficiency, and patterns of language use have been put forward as predicting factors for which language will show the best recovery; to date, there is evidence that some or all of these variables interact to predict patterns of impairment and recovery in multilingual aphasia, but there is no consensus about their relative roles and the manner in which they interact (Goral, 2012b). For example, whereas in several reports relative comparable impairment was evident in all languages of multilingual speakers who acquired aphasia (e.g., de Diego Balaguer, Costa, Sebastián-Gallés, Juncadella, & Caramazza, 2004; Edmonds & Kiran, 2006), for other individuals it

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was their first-acquired language that was more accessible to them than their later-learned languages (Croft, Marshall, Pring, & Hardwick, 2011 [participant 2]; Goral, Levy, Obler, & Cohen, 2006). As well, there have been reports of later-learned languages demonstrating milder impairment than earlier-acquired languages (e.g., Faroqi-Shah & Waked, 2010; Ibrahim, 2008). The differential abilities may be manifested in overall language abilities or in selective language skills, such as comparable comprehension impairment but differential production abilities (e.g., Marshall, Atkinson, Woll, & Thacker, 2005 for a bimodal sign-language-English speaker), comparable spoken language abilities versus differential writing impairment (e.g., Kambanaros, Messinis, & Anyfantis, 2012, for a Greek-English bilingual), or comparable overall impairment but differential impairment of morphological abilities (e.g., Knoph, 2011, for a trilingual Persian-English-Norwegian speaker).

In some cases, unintentional language switching or mixing of the two languages occurs (Abutalebi & Green, 2008). In such cases, multilingual people with aphasia may insert elements from one of their languages while speaking another, even if their interlocutors do not understand that language. This impaired switching ability may occur without the conscious awareness of the person with aphasia. In contrast, the retrieval of elements from the nontarget language could also serve as a strategy to facilitate retrieval of elements in the inaccessible target language (Ansaldo, Marcotte, Scherer, & Raboyeau, 2008).

A key question in aphasia rehabilitation, of theoretical and clinical implications, has been whether aphasia rehabilitation administered in one of the multilingual's languages positively affects the untreated languages. The presence or absence of cross-language treatment effects may be indicative of interdependent versus independent underlying representation and processing of multiple languages. Clinically, decisions about language choice for rehabilitation should ideally be informed by research evidence. Here, as in patterns of initial impairment and gradual recovery, variables of language proficiency, use, and linguistic similarities are likely to affect between-language influences. And, here too, studies in multilinguals with aphasia published to date have yielded inconsistent results (see reviews in Faroqi-Shah et al., 2010; Kohnert & Peterson, 2012; Obler & Park, 2012).

Several findings point to the role of relative language proficiency in cross-language generalization, suggesting cross-language facilitation from a treated language to a comparably recovered language or to a weaker language but a lack of facilitation or—in some cases—negative consequences from a weaker treated language. For example, Miertsch, Meisel, and Isel (2009) documented a multilingual individual with aphasia who had comparable poststroke abilities in his L2 English and L3 French and better recovered abilities in his L1 German. The authors found improved performance in L2—but not in L1—following treatment in L3. Similarly, improved grammaticality in language production of a multilingual speaker was documented in French, which was the participant's untreated weaker L3 following treatment in his more recovered L2, English (Goral, Levy, & Kastl, 2010). At the lexical level, improved naming performance was found between the two languages of Spanish-English bilinguals with aphasia

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when the treated Spanish and untreated English were of comparable proficiency (Edmonds & Kiran, 2006). However, the two other participants reported in Edmonds and Kiran showed no generalization from English (the treated language) to Spanish (the untreated, weaker language).

In other studies, a similar lack of cross-language generalization has been documented for treatment administered in the weaker language. Namely, there was no facilitation from treatment in English (a participant's L2) to the untreated French (his first and more dominant language) (Miller Amberber, 2012); nor from treatment in German to the untreated French in an early bilingual with reportedly comparable abilities in his two languages prior to the stroke but a more impaired French poststroke (Meinzer, Obleser, Flaisch, Eulitz, & Rockstroh, 2007). Evidence for negative cross-language effects following treatment was found in a study by Abutalebi, Rosa, Tettamanti, Green, and Cappa, (2009) for a bilingual who was treated in his weaker post-CVA L2 (Italian): His scores in L1 (Spanish) were lower post-treatment in Italian than prior to the treatment.

Two additional variables have been implicated in cross-language results. One is the linguistic context of the individuals. Thus, for example, the language of environment may have affected the relative improvement of the participant reported in Goral, Rosas, Conner, Maul, and Obler (2012), who showed marked improvement in English, his less accessible language but the language of environment at the time of the treatment, and no positive effect on his more proficient Spanish. The other relates to similarities and differences between a given pair of languages, a variable mentioned above as a contributing factor to differential impairment in multilinguals. For example, Kohnert (2004) demonstrated that improved production in the nontreated language was only evident in cognate words. The influence of language similarities may also explain the results reported in Goral et al. (2010) for French morphosyntactic elements, such as the improvement in pronoun-gender agreement (a feature relevant to both English and French) but not in article-noun agreement (a feature relevant to French but not English), following treatment in English.

By and large, the data currently available from studies of multilingual aphasia can be interpreted within current frameworks of multiple language representation in the brain. These include theories of convergence of brain regions and networks associated with all languages of multilinguals (Abutalebi & Green, 2007; Indefrey, 2006). Proponents of this view attribute any differential sparing and impairment to processes of language control, rather than to a differential representation of the different languages. Moreover, facilitation and inhibition between pairs of languages can be predicted by theories of multiple language activation (Costa, 2005; Kroll, Bobb, & Wodniecka, 2006; Marian, Spivey, & Hirsch, 2003). For example, the hypothesis that all languages of multilinguals are active and therefore the target language of a given communication intent needs to be activated, whereas the nontarget languages must be inhibited, predicts a processing cost associated with the reactivation of a previously inhibited nontarget language. In aphasia rehabilitation, these patterns of inhibition and activation can manifest in differential accessibility of the languages during and following treatment (Goral, 2012a).

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Dementia

Dementia can be defined as acquired impairments in multiple cognitive domains (e.g., memory, language, orientation, monitoring) caused by brain dysfunction (Mendez & Cummings, 2003). Dementia has been associated with degenerative diseases, such as Alzheimer's disease and Parkinson's disease, and with diffuse or multifocal brain pathologies that are considered different from the brain changes associated with healthy aging (e.g., Petersen, 2002).

Language and communication impairments accompany many forms of dementia. One common problem is word-finding difficulty (anomia), characterizing dementia of the Alzheimer's type and primary progressive aphasia, as well other types of dementia (Aronoff et al., 2006; Mesulam et al., 2009; Ober, 2002). Specifically, individuals with dementia often fail to retrieve a target word during experimental testing as well as during natural conversation. Circumlocutions (saying "that thing that takes you up and down in a building" for "elevator"), semantic paraphasias (saying "mother" for "daughter"), and empty speech (using words such as "thing" and "this") are often produced. The anomia may be due to retrieval difficulties and, in some types of dementia, may be associated with semantic impairment (e.g., Mesulam et al., 2009; Rogers, Ivanoiu, Patterson, & Hodges, 2006). As well, many individuals with dementia demonstrate impairments in their ability to comprehend complex discourse and in their discourse production (Hamilton, 2008). Studies typically report the failure to maintain the topic of conversation or to follow a change in the topic, as well as inappropriate use of pronouns and other anaphora (e.g., Almor, Kempler, MacDonald, Andersen, & Tyler, 1999; Welland, Lubinski, & Higginbotham, 2002). Morphological and syntactic abilities have been found to be largely preserved in dementia (Kavé & Levy, 2004; Kavé, Leonard, Cupit, & Rochon, 2007).

An ongoing debate in the literature on dementia concerns the relations among language impairment and deficits in other cognitive domains, such as working memory and executive function. For example, it is possible that the difficulty in maintaining discourse topics and following a conversation is rooted in an attention or memory deficiencies and that instances of anomia may reflect a more general memory decline and an overall decreased executive functioning (e.g., Bayles & Tomoeda, 2007; Kempler & Goral, 2008).

Limited attention has been paid to the manifestation of dementia among multilingual speakers in the major, currently available textbooks about dementia. However, there is a small body of recent literature addressing two main questions about dementia in multilingual and multicultural populations. One concerns the so-called bilingual advantage, reported for healthy bilingual individuals. That is, findings suggest that older bilinguals have superior cognitive control abilities as compared to their monolingual peers. For example, Bialystok and colleagues (Bialystok, Craik, Klein, & Viswanathan, 2004) found smaller difference between younger and older bilinguals than between younger and older monolinguals on the Simon Test, a task that measures inhibitory control. These data have been partially replicated in additional studies (Bialystok et al., 2005); however, several recent studies have failed to find a bilingual superior performance on tests of inhibitory control, questioning the existence of a bilingual

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advantage (for a review, see Hilchey & Klein, 2011). Nevertheless, other studies support the notion of bilingualism as a factor contributing to cognitive reserve. The notion of cognitive reserve has been employed to account for interindividual differences in the manifestation and rate of cognitive deficits in dementia (Stern, 2002, 2009). That is, individuals with more cognitive reserve—such as those with high education levels and those engaged in complex mental activities throughout their lives—display measurable cognitive deficits later in the course of the dementia than individuals with lower reserve (Manly, Schupf, Tang, & Stern, 2005). One contributing factor to reserve may be the cognitive practice that bilinguals enjoy throughout their lives (Kempler & Goral, 2008; Rivera Mindt et al., 2008). Consistent with this notion, several studies reported older age of dementia onset for bilinguals or multilinguals than for monolinguals (Bialystok, Craik, & Freedman, 2007; Kavé, Eyal, Shorek, & Cohen-Mansfield, 2008).

The other question raised in recent studies on dementia in multilinguals asks whether the language impairment that accompanies the dementia is comparable in the two languages of bilinguals or whether the impairment is selective. In that, this question mirrors the one asked about aphasia in multilinguals, as described above. And, similar to the literature on aphasia, here too, published data are mixed, supporting both comparable impairment in some individuals and selective in others.

Mendez and colleagues have reported greater preservation of the first-acquired language as well as selective use of L1 in individuals with dementia (Mendez, Perryman, Pontón, & Cummings, 1999; Mendez, Saghafi, & Clark, 2004). Support for a selective impairment is also found in reports of bilingual individuals with dementia favoring their first-acquired language, at times using it exclusively, even if inappropriately (De Santi, Obler, Sabo-Abramson, & Goldberger, 1990; Friedland & Miller, 1999). McMurtray, Saito, and Nakamoto (2009) have proposed that patterns of uncontrolled reverting to L1 may be an early indicator of dementia. The two patients they reported had been regular users of their Japanese and English and demonstrated a shift to predominant use of L1 prior to developing cognitive impairment later diagnosed as dementia. However, Gollan, Salmon, Montoya, and da Pena (2010) have demonstrated that greater impairment may be detected in the dominant—albeit not necessarily the L1—of bilinguals with dementia when performance is compared to similar bilinguals without cognitive impairment.

In contrast to the studies that showed a differential preference of the L1, language testing in several cases of dementia revealed parallel impairment of both languages. This was the case for one Spanish-English bilingual (Hernández, Costa, Sebastián-Gallés, Juncadella, & Reñé, 2007) and four Japanese-Portuguese bilinguals (Meguro et al., 2003). In these studies, there were no significant differences between performance in the first and second languages of individuals who acquired dementia. Yet, despite overall comparable levels of impairment, language-specific characteristics appear to influence the manifestation of the impairment in each language. For example, the reading performance of the bilinguals in Meguro et al. was virtually intact when faced with Japanese Kana writing (the writing system with a shallow grapheme to phoneme correspondence) and with Portuguese words that had regular spelling, but more impaired when

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presented with words written in Kanji (the less transparent writing system, based on Chinese characters).

In summary, the study of language impairment in multilingual individuals with dementia is at an early stage, and its results do not point to uniform pattern of parallel or selective impairment. Preliminary findings suggest that bilinguals may benefit from cognitive advantages over their monolingual peers at the onset of the manifestation of cognitive impairment associated with dementia. There is no published evidence to date on language treatment in individuals with language impairment associated with dementia.

Traumatic Brain Injury (TBI)

Little is known about the manifestation and recovery patterns of the languages of multilingual speakers following acquired language impairments resulting from a traumatic brain injury (TBI). Individuals who sustained a TBI may experience mild, moderate, or severe cognitive impairment. The severity and type of impairment is associated with the size and location of the damage to the brain and with the duration of loss of consciousness. Two hallmark language difficulties of TBI are word-finding difficulties and impaired discourse abilities. As in dementia, some deficits may be viewed as specific to language and others may be secondary to other cognitive impairments, such as impaired attention, memory, monitoring, and organization skills (Coelho, 2002).

If the acquired brain injury occurs during childhood, brain plasticity typically will allow for neuronal reorganization and thus for adequate, if not complete, recovery of most language skills (Chilosi et al., 2008; Vicari et al., 2000). However, despite typically better recovery of children with TBI than of those who sustained the injury during adulthood, lingering cognitive impairment has been reported for children as well as adults recovering from TBIs (Code, 1999; Tavano et al., 2009). Here, as in reports of language impairment in multilingual speakers following a left-hemisphere stroke, questions can be asked about comparable versus differential impairments of the two or more languages and about the circumstances or variables that may contribute to nonparallel patterns.

In one of the few published studies on the course of language impairment following TBI in a bilingual child, Tavano et al. (2009) reported on an Arabic-Italian bilingual who sustained left-sided brain injury at the age of 7 months. Testing at 8, 18, and 31 months revealed impaired cognitive abilities, such as memory and attention, and severe impairment of expressive and receptive language abilities. The impairment was similar in both his Italian, the language of the environment, and Arabic, the language spoken at home.

Another case was reported by Sebastian, Dalvi, and Obler (2012), highlighting the role of the writing system in rehabilitation from aphasia resulting from a TBI. The patient was a multilingual with proficiency in Marathi, English, and Hindi who sustained a TBI at age 16. Of interest here is the differential impairment evident in his expressive language skills, amid comparable abilities in his comprehension skills in both Marathi and English. Specifically, whereas both languages demonstrated impaired production, there was a differential effect of modality with better spoken language abilities in Marathi but better

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written ability in English. Treatment, provided bilingually 16 years postonset, was effective, resulting in a less-severe agrammatism in both languages. It is possible that language-specific differences between Marathi and English influenced the pattern of impairment manifestation in this participant, similar to differential language effects reported above for individuals with aphasia and dementia.

In one report on a multilingual adult who sustained TBI, Eng and Obler (2002) reported on a 65-year-old man, a Toisanese-Cantonese-English speaker who acquired dyslexia following a fall. His most notable impairment was his slow and error-prone reading, observed in both English and Cantonese. Upon testing, comparable patterns of errors (e.g., more errors on low-frequency words) were observed in both languages tested. Nevertheless, script-specific effects were also noted; for example, visual errors characterized his performance in English, whereas semantic errors were typical of his performance in Chinese. This dissociation is likely linked to orthography-specific effects, as it has been reported for languages that differ in their script systems (e.g., Eng & Obler, 2002, for Chinese and English) but not for languages that share orthographic systems (e.g., Laganaro & Overton Venet, 2001, for Spanish and English).

Additional information about how language-specific characteristics affect impairment and recovery in multilinguals is warranted. The manifestation and recovery trajectory of the languages of multilingual speakers following TBIs is fertile ground for future research.

SUMMARY AND FUTURE DIRECTIONS

The literature reviewed here clearly demonstrates a growing interest in the study of language disorders among multilingual and multicultural individuals. The study of these individuals may offer researchers a window into the complexities of language learning, representation, and processing, through the dissociation of language-specific and language-independent patterns. At the same time, understanding how language-specific variables can affect impairment, assessment, and treatment, and how developmental and acquired language disorders may manifest in multilingual individuals, is critical for maximizing the quality of services provided to individuals with language impairment and for increasing the efficacy of rehabilitation approaches. Linguists, clinicians, and theoreticians collaborate in this interdisciplinary effort.

NOTES

1 We use the term *primary language impairment* (PLI) exclusively here (regardless of the terms used by the authors cited) in line with Kohnert (2010), who provided two reasons in favor of using the term. First, the term *specific language impairment* (SLI) seems less appropriate given that the specific characteristics of the impairment may change over time and may include concomitant nonlinguistic difficulties. Second, if we simply omit the "specific" before "language impairment," the common abbreviation "LI" may be visually confused with "L1."

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2 Although grammatical deficits predominate, subtypes of PLI have been documented in children who may exhibit deficits in one or more different language components (e.g., Leonard, 1998; Schwartz, 2009).
3 As an alternative see J. Paradis, Schneider, and Duncan (2013), who investigated the possible identification of children with PLI from language testing in their L2.
4 Children with persistent difficulties in reading and writing in conjunction with PLI, dyslexia, or others will likely be classified under Specific Learning Disorder according to the DSM-V criteria.
5 For an examination of the relationship between PLI and dyslexia, see Bishop and Snowling (2004) and Catts, Adlof, Hogan, and Weismer (2005).
6 The orthography of a given language may be recoded by the reader into multiple grain sizes (e.g., in English *-ight* and *-tion* are recognized as larger granules than the individual phonemes in *credit*; see Ziegler & Goswami, 2005, 2006).
7 SVR is a component of the componential model of reading. See Joshi and Aaron (2012) and Chiu, McBride-Chang, and Lin (2012).
8 Because families may have been more likely to respond to the survey if they were maintaining a bilingual home, the author pointed out that this figure is not indicative of the decision of multilingual families in general.
9 This advantage for sign language, the authors suggested, was due to the twins' ability to utilize the iconicity of sign to extract meaning rather than a reflection of language dominance (Woll, personal communication, August 2012).

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Abutalebi and Green have put forward a model of bilingual language processing, employing the notion of inhibitory control. In their work they have demonstrated that, given evidence for the language nonselective activation in bilinguals, bilinguals practice inhibitory control to manage activation and inhibition of their languages. Furthermore, they concluded that existing evidence points to a convergence of the underlying representation of the two languages of bilinguals. The authors proposed a complex neuronal mechanism that engages cortical and subcortical brain regions to explain how, amid the overlapping language representation and the co-activation of the languages, bilinguals resolve competition between their languages and select the appropriate language for communication. When this network is impaired, as in aphasia, language-selection impairment may result.

Gollan, T. H., Salmon, D. P., Montoya, R. I., & da Pena, E. (2010). Accessibility of the nondominant language in picture naming: A counterintuitive effect of dementia on bilingual language production. *Neuropsychologia, 48*(5), 1356–1366. doi: 10.1016/j.neuropsychologia.2009.12.038

Gollan and colleagues have set out to compare naming performance of bilinguals with and without dementia. They studied 29 Spanish-English bilingual with a diagnosis of probable Alzheimer's disease and 42 neurologically healthy individuals. In each group, about half of the participants were dominant in Spanish and about half dominant in English. When the authors compared naming accuracy in the clinical and control groups, they found greater difference for the dominant language than the nondominant language. This was true for both participants who were dominant in English and those who were dominant in Spanish. The authors concluded that despite reports that suggest that bilinguals with Alzheimer's disease prefer using their first language, impairment may be more evident in their dominant (typically first) language.

https://doi.org/10.1017/S026719051300010X Published online by Cambridge University Press

Kavé, G., Eyal, N., Shorek, A., & Cohen-Mansfield, J. (2008). Multilingualism and cognitive state in the oldest old. *Psychology and Aging, 23*(1), 70–78. doi: 10.1037/0882–7974.23.1.70

This intriguing study by Kavé and colleagues suggests that the potential cognitive advantage associated with being bilinguals extends beyond bilingualism. The authors analyzed interview data collected from a large sample (over 800 participants) of people age 75 and older who spoke two, three, four, or multiple languages, and found a positive correlation between participants' scores on a dementia screening test and the number of languages they spoke. Further study with more specific and sensitive measures is warranted to confirm and extend this promising finding.

McBride-Chang, C., Liu, P. D., Wong, T., Wong, A., & Shu, H. (2012). Specific reading difficulties in Chinese, English, or both: Longitudinal markers of phonological awareness, morphological awareness, and RAN in Hong Kong Chinese children. *Journal of Learning Disabilities, 45*(6), 503–514. doi: 10.1177/0022219411400748

This longitudinal study by McBride-Chang and colleagues addresses how reading difficulties may manifest differently between the languages of Chinese-English biscriptal readers in Hong Kong and explores reasons for these differences. The authors looked at the relative contributions of morphological and phonological awareness tested in Chinese to reading proficiency in typically developing and poor readers of these two orthographically distant languages. The results highlight the connection between poor reading in Chinese and morphological awareness vs. poor reading in English and poor English word recognition. Slow performance on rapid-naming tasks and poor phonological awareness, characteristic of poor readers of both languages, suggest that these factors may reflect skill sets important for reading in both languages. Sociolinguistic factors are also considered.

Paradis, J. (2010a). The interface between bilingual development and specific language impairment. *Applied Psycholinguistics, 31*(2), 227–252. doi: 10.1017/S0142716409990373

In a keynote article, Paradis provided a carefully crafted analysis of current research on bilingual language development as it pertains to specific language impairment. The author discussed current theories about the underlying impairment in SLI and critically reviewed studies that support and challenge these theories across languages and in multilingual children. Paradis then addressed the implications of this body of research for assessment and differential diagnosis of bilingual children with and without SLI along with considerations for improving efficacy of language intervention. The commentaries and author's response that follow this article offer insight into the challenges facing researchers as they attempt to disentangle SLI and typical bilingual language performance.

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