ELSEVIER

Journal of Neurolinguistics 21 (2008) 199–230

Journal of NEUROLINGUISTICS

www.elsevier.com/locate/jneuroling

Review

Bilingualism and neuropsychiatric disorders

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Received 18 June 2007; received in revised form 13 September 2007; accepted 13 September 2007

Abstract

A range of psychotic manifestations (including auditory hallucinations, delusions, conceptual disorganization, anxiety, and depression) have been reported to occur in either one or all of a patient's languages. The reasons why one of the patient's languages may be more affected than others is investigated. Whether a particular language should be used in psychotherapy, and if so, which one, is also explored. The need for bilingual health professionals and the advantages and disadvantages of using interpreters are assessed. Different aspects of biculturalism (as distinct from bilingualism) and their various implications are examined. The possible effects of age and manner of second language appropriation are discussed. Differential symptoms in bilingual individuals with Huntington's, Parkinson's and Alzheimer's diseases are briefly reviewed. Parallels between bilingual aphasia and symptoms of psychoses and dementia are outlined. These various phenomena are considered within the framework of a neurolinguistic theory of bilingualism.

Keywords: Bilingualism; Psychosis; Schizophrenia; Hallucinations; Dementia; Biculturalism; Psychotherapy; Declarative/procedural memory

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doi:10.1016/j.jneuroling.2007.09.002

1. Introduction

In this review, the contribution of psychiatric disorders to a neurolinguistic theory of bilingualism will be examined. The psychoanalytic literature will be referred to only in the rare cases when the views expressed overlap with neuropsychiatric concerns. We will not even consider all aspects of psychiatry, or of bilingualism, which are pertinent to therapy per se, but only those that are directly relevant to the various integrated hypotheses proposed in a neurolinguistic theory of bilingualism (Paradis, 2004). In this respect, the study of bilingualism in neuropsychiatric disorders explores the use and relative importance of the five neurofunctional mechanisms engaged in verbal communication: implicit linguistic competence, metalinguistic knowledge, pragmatics, emotion, and thought. In particular, it highlights the thought/implicit-language interface and the connections between the system underlying emotions and the various language and paralanguage processes. Another point of interest is that many psychiatric phenomena have a counterpart in bilingual aphasia phenomena, which provides additional support for the proposed theory.

Bilingualism profoundly impacts psychiatric diagnosis and psychotherapy because language is the primary tool of both processes (Bamford, 1991; Schmidt, 1965; Segovia Price & Cuellar, 1981). Psychiatric assessment is largely achieved through the mechanism of a clinical interview. It is unavoidably a subjective instrument for assessing psychosis. But, as one reviewer noted, no alternatives are available. As a result, inconsistencies in the literature may be due to the poor reliability of this clinical tool. Just as bilingual aphasia manifestations differ as a function of the structural diversity of their languages, symptoms of mental illness may be language- and culture-specific: even where a diagnosis is agreed upon, patients from differing cultural backgrounds present with widely different symptom pictures (Cuellar, 1982). Language and culture can affect the etiology, manifestations, course, treatment, and outcome of mental disorders, including schizophrenia.

Psychiatrists focus on the question of *why*, in some bilinguals, only one language is available during acute psychosis, and in particular, why the mother tongue. Neurolinguists investigate *how* it is possible for one language to be selectively involved in the first place. The phenomenon is of particular interest in that it provides further evidence in favor of the neurofunctional separability of two languages. In this paper, schizoid manifestations will

be considered first, followed by dementias (in Alzheimer's, Parkinson's and Huntington's diseases).

2. Dissociation of schizophrenic symptoms according to language

Schizophrenia is a heterogeneous group of disorders, considered as one of the most complex of all mental health ailments. It involves a severe, chronic, and disabling disturbance of brain functions. It is a mental illness in which the person suffers from disturbances of language and communication, with disorganized and incoherent speech, distorted thinking, misperceptions, delusions, hallucinations, and a reduced ability to feel normal emotions. So-called positive symptoms are aberrant thoughts and abnormal perceptions; negative symptoms refer to impaired normal functions (blunted affect, apathy, anhedonia), and possibly schizophasia (a meaningless mixture of words and phrases characteristic of advanced schizophrenia). The schizophasic discourse may include passages of reduced semantic value because sequences are based on alliteration, assonance, rhyme, and formal associations (glossomania); denotation is weakened for the benefit of word play (Bérubé, 1991).

Polyglot schizophrenic patients can present with either different or less psychotic symptoms depending on the language they use. In Hemphill's (1971) landmark study of a series of 30 fluently bilingual schizophrenic patients, some individuals appeared to be non-psychotic, logical, and realistic; they had normal emotional rapport and were able to perform normally in the business, home, or teaching environments, provided the non-native language was spoken. Such a patient is liable to be diagnosed as psychotic in one language, but normal when interviewed in another. Note that all reported cases were highly proficient, fluent bilinguals who used both languages every day; some patients were poorly educated, some were teachers and well educated, but the findings were common to all. Some were observed for more than 2 years. (The fact that the patients were fluent bilingually does not mean that the two languages necessarily make equal cognitive demands on the individual, as will be discussed below.) More recently, three patients assessed by De Zulueta, Gene-Cos, and Grachev (2001) were found to have different positive symptoms depending on the language used in the interview by the same bilingual researcher. In multilingual schizophrenic patients, one language may become less fluent (Hughes, 1981), even selectively ungrammatical, while others are semantically and grammatically correct (Javier, 1989; Matulis, 1977). Language competence varies with the patient's level of psychosis (Toppelberg, 1996); patients who are bilingual when they are stable are often unable to express themselves in their second language when they are acutely psychotic (Oquendo, 1996a).

In 1895, the year Pitres published his monograph on aphasia in polyglots, Lewis C. Bruce, Assistant Physician at the Royal Asylum in Edinburgh, reported on a case of a demented Welsh sailor who spoke only English during periods in which he was restless, talkative, destructive and malicious, subject to chronic mania, and only Welsh during alternating periods when he was apathetic, unresponsive, shy, suspicious, appeared constantly on the look out for unseen danger, was suspicious and distrustful of attendants and doctors, and did not understand any English; he ignored familiar and coveted objects in which he showed a keen interest during the English stage (Bruce, 1895).

When in the English stage, the patient was able to relate incidents in his past life and clearly remembered things he had noticed in previous English periods. He recognized and

was friendly to the staff. Conversely, his memory was a blank to anything that occurred during the Welsh stage (including an incident when his arm was burned and blistered).

Occasionally, when changing from the Welsh to the English stage, or the reverse, the patient passed through an intermediate condition in which he spoke a mixture of Welsh and English and understood both languages. This intermediate stage was often absent, with the patient suddenly waking up to life and activity, or suddenly becoming apathetic—a behavior reminiscent of Oliver Sacks's patients described in *Awakenings* (Sacks, 1990).

2.1. Auditory hallucinations

One of the most salient and often reported positive symptoms in bilingual individuals with schizophrenia is the hearing of voices. Hemphill (1971) reported that auditory hallucinations occurred only in the first-acquired language, irrespective of which language the patients preferred speaking or habitually used. This was also the case when the hallucinations reappeared during a relapse. Conversely, some authors report hallucinations only in the second language: Malo Ocejo, Medrano Albeniz, and Uriarte Uriarte (1991) describe four patients whose native language, which they usually spoke, was Basque, whereas their hallucinations were in Spanish. Other authors report that some schizophrenic patients hear voices in both of their languages (De Zulueta et al., 2001; Dores, M'Bodj, & N'Dao, 1972). Laski and Taleporos (1977) relate the case of a 13-year-old Spanish–English bilingual patient who reported having auditory hallucinations in English, his second language (the devil was threatening to get him). Following treatment, his hallucinations subsided but shortly after discharge he developed a toxic reaction to medication and the hallucinations reappeared, conveying the same threat, but only in Spanish this time.

When polyglot psychotic patients experience auditory hallucinations in more than one language, they usually report hearing friendly voices in their native language and hostile voices in their foreign language, although this may be reversed in circumstances when the individuals have reasons to fear aggression from compatriots (Lukianowicz, 1962).

Of the six patients (four Chinese-American, two Latino-American immigrants) described by Wang, Morales, and Hsu (1998), two heard voices in both their languages, three in their native language only, and one solely in his poor L3, depending on whose voices they believed them to be (e.g., of a friend, the attending psychiatrists, or ghosts from Hong Kong). One patient, who believed that the voices were of non-human aliens, heard them speak in Cantonese interspersed with English words.

Similar hallucinatory phenomena have been reported in sign language and finger spelling in congenitally deaf schizophrenic patients (Rainer, Abdullah, & Altshuler, 1970). Also, a young woman, many years after the onset of blindness, is reported to have experienced a schizophrenic reaction with hallucinations in braille (Freeman & Williams, 1953).

Auditory hallucinations may occur in the absence of other features of schizophrenia (Hemphill, 1971). On the other hand, they occur not only in schizophrenia, where they are probably most conspicuous, but also in states of alcohol withdrawal, acute brain syndrome, high fever, intoxication, drug-induced delirious psychosis (cannabis, mescaline), iatrogenic disorders (atropine, neuroleptics), as well as in conditions of organic origin, such

as epilepsy, and during cortical electric stimulation (Hemphill, 1976; Herbert, 1984). The mechanism is the same; only the etiology, that is, the triggering agent, differs. As always, irrespective of the causes, the effects are limited by the structure of the neurofunctional systems involved.

Hemphill (1971) suggests that, because in all of his 30 patients, the coding process for verbal thought was impaired in one language but intact in the other, it is unlikely that a primary disorder of thinking is responsible for the voice hallucinations in schizophrenia, or they would be produced in both languages. Pitres (1895) had used a similar kind of rationale when he argued that languages are not lost in cases of successive recovery in bilingual aphasia, but inhibited; otherwise, the unavailable language would not have spontaneously reappeared.

The strong link between hallucinations and a particular language (sub)system is underscored by the difficulty patients have in reporting voices in the other language. Some say they have not heard any, or cannot remember. But when asked in the language of the hallucinations, they are able to discuss the voices easily, even if they had just denied, in the other language, having heard them (Hemphill, 1971). De Zulueta et al. (2001) also report on a patient who denied hearing voices when questioned in English, but admitted freely to hearing them when questioned in Italian—these voices spoke in Italian.

The hallucinations are generally reported to be heard as though they were spoken by specific individuals, with the corresponding gender, accent and pitch, and in the appropriate language; they are likely to be secondary to an underlying delusional framework. The validity of self-reports of the language of hallucinations by patients may be questionable, but probably no more so than the report of hallucinations in the first place. Unfortunately, there are no other means of verifying their accuracy other than perhaps by establishing the consistency of these reports in the context of the patient's general behavior.

2.2. Anticholinergic drugs and ECT-induced symptoms

Lipsius (1975) relates the case of a severely depressed patient, who, shortly after receiving six electroconvulsive treatments, was unable to speak English at times and often spontaneously spoke French, her native language, which she did not speak in her home or in the community before her course of electroconvulsive treatment.

In a comment on Lipsius's (1975) paper, Rosenbaum and Gelenberg (1975) report a case of iatrogenic selective loss of one of a patient's languages. In the course of electroconvulsive treatment for an agitated depression, the patient received amitriptyline (a drug that inhibits the production of the neurotransmitter acetylcholine). The patient, who had emigrated to the United States from Italy, became unable to speak English and could only use the local dialect of the town of his birth. When, after 10 days, he was given physostigmine (a cholinergic drug that prolongs and intensifies the action of acetylcholine) he spontaneously began communicating in English again. The authors conclude that the dramatic response to physostigmine indicated that the patient's inability to speak English was related to anticholinergic toxicity. They point out that Lipsius's patient had also been given amitriptyline, suggesting that the syndrome might have been caused by the drug rather than the electroconvulsive treatment (though the latter may have a synergistic effect).

In the patient described by Laski and Taleporos (1977), hallucinations in English disappeared after chlorpromazine treatment; later, following intake of benztropine mesylate medication, his auditory hallucinations returned, but in Spanish. They disappeared following injection of physostigmine. It would appear that this was also a case of anticholinergic toxicity.

Hemphill (1971) reports that phenothiazine medication suppressed the patient's hallucinatory voices, which, together with the three preceding cases, shows that the hallucinations have a neurobiological origin. In fact, different concentrations of biochemical substances can lead to hallucinations in different languages, as seen with the patients treated with anticholinergic drugs (more accurately, drugs with anticholinergic effects) mentioned above, which also speaks to the issue of a specific thought–language interface for each language subsystem.

Kalinowsky (1982) relates the case of a 40-year-old highly educated trilingual schizophrenic woman who, after 10 electroconvulsive treatments, no longer spoke English (her third language and the language of the hospital environment), but unexpectedly spoke German (her second language), which those around her did not understand. After several more electroconvulsive treatments, she began to speak Russian, her native language. Four or five days after the last treatment the patient changed back from Russian to German, and a few days later she started to speak English as fluently as at the beginning of her treatment. The author does not report whether anticholinergic medication was administered during the treatment. However, this is very likely the case because it is commonly administered to alleviate spastic muscle contractions associated with electroconvulsive treatment.

2.3. Which language is most affected, and why?

Some authors report that patients with paranoid schizophrenia use their native language almost exclusively during acute episodes of psychosis, even though their second language is fluent and more than adequate (Del Castillo, 1970; Heinemann & Assion, 1996; Hughes, 1981; Segovia Price & Cuellar, 1981; Zislin, Kuperman, & Durst, 2002). Patients appear obviously psychotic during native-language interviews, but much less so, or not at all, when the interview is conducted in their L2. Some researchers go so far as to consider that the mother tongue is more pronounced in the *generation* of the psychosis (Del Castillo, 1970; Hemphill, 1971; Zislin et al., 2002). In any case, it would appear that patients express more pathology in bilingual and L1 interviews than in L2 interviews (Malgady & Costantino, 1998). The second language appears to be affected to a different degree and in a different way than the first language (Oquendo, 1996b).

But other authors (Marcos, Alpert, Urcuyo, Kesselman, 1973; Marcos, Alpert, Urcuyo, Kesselman, & Alpert, 1973) report the opposite phenomenon, where patients exhibit significantly greater psychopathology when interviewed in their second language in which they are nevertheless fluent. Dores et al. (1972) also report the case of a Wolof–French bilingual patient whose French (L2) was choppy, disconnected, incoherent, violent, with abrupt halts, whereas his Wolof (L1) was perfectly coherent, without schizophasia, fluid, and calm.

Because the dominant language is considered to have a richer emotional structure (Pitta, Marcos, & Alpert, 1978), patients may use a second language as a form of resistance in psychotherapy, to avoid intense affect (Baxter & Cheng, 1996; Carlson, 1979; Oquendo,

1996a). A language that is not their own, in which patients have to make an effort to understand and to respond, can act as a stimulus that shakes them up and puts them in closer touch with reality (Del Castillo, 1970).

2.4. Which language should be used in psychotherapy?

Since verbal interaction is the instrument of psychotherapy, the existence of two independent language systems may be expected to influence the treatment process. There does not seem to be any consensus on whether therapy is preferable in the native or the second language. Carlson (1979) finds that psychotherapy is facilitated by the use of the mother tongue: the native language is generally seen as the language most connected to affect, whereas L2 is more emotionally detached and resistant to facing conflicts. Therapy is best conducted in the stronger language in order to tap internal cognitive processes. The assessment should be conducted in the language most compatible with the bilingual client's language proficiency and dominance (Cofresi & Gorman, 2004). Therapy that uses the second language as the main form of communication may suppress the mother tongue and the affective experiences tied to it. For example, use of the native language brings forward not only the expression of tonal affect but also appropriate physical and kinesthetic expression (Rozensky & Gomez, 1983).

Other authors, on the contrary, suggest that therapists of a language and culture other than those of their mainstream patients (but who nevertheless have a good grasp of the patients' language and culture) are able to facilitate the therapeutic process by allowing their patients to look at their difficulties from an alternative perspective (Cheng & Lo, 1991).

Given that the clients' ability to express emotional and psychological experiences may vary widely across their languages, treatment may need to be bilingual in order to tap the strengths of both linguistic systems. Use of one language in therapy may block access to some affective processes (Marrero, Golden, & Espe-Pfeifer, 2002).

Predicated on the assumption that a patient's native language plays a prominent role in the generation of psychosis, Zislin et al. (2002) suggest the inducement of switching to the second language in order to impede the generation of psychosis.

Use of a patient's second language in psychiatric evaluation and treatment has a variety of effects. Therapists may switch into L1 to overcome the patient's resistance or into L2 to decrease emotional intensity when necessary (Oquendo, 1996a). With language switching, affect distancing can be reversed and utilized therapeutically (Pitta et al., 1978; Rozensky & Gomez, 1983; Santiago-Rivera & Altarriba, 2002).

2.5. Psychoses: parallels with bilingual aphasia

As with bilingual aphasia, it is recommended that, before conducting any assessment, the clinician should ascertain the client's specific language history and preferences, and evaluate the client's sociocultural background and level of acculturation (Altarriba & Santiago-Rivera, 1994; Cofresi & Gorman, 2004; Malgady, Rogler, & Costantino, 1987; Rozensky & Gomez, 1983).

Moreover, as with bilingual aphasia, translations of assessment tools should be reliable and valid within the target culture. Cross-cultural equivalence of items in translated tests is crucial in this respect (Cofresi & Gorman, 2004). There is no reason to expect that

a reliable and valid research instrument in one language will accurately measure the phenomenon as experienced by people from another language and culture (Varricchio, 1997). As with the adaptation of the *Bilingual Aphasia Test* (BAT) into various languages (see Paradis & Libben, 1987), for patients with dementia, mental health professionals (Lin & Chang, 2003; Robles Garcia, Garibay Rico, & Páez Agráz, 2006) acknowledge that testing equivalence is a first step in determining the psychometric properties of a test in a new language to ensure that studies using the translated version will be valid. They also point out that researchers who translate an instrument into another language should consider not only the linguistic but also the cultural appropriateness of research tools (cf. Varricchio, 1997). Only reliability and validity similar to the original version can ensure the adequacy of the translation (Flaherty et al., 1988; Hilton & Strutkowski, 2002). As with the BAT, items must often be changed to achieve criterion equivalence (i.e., for the interpretation to remain the same when compared with the norm for each culture) and conceptual equivalence (i.e., for the instrument to measure the same theoretical construct in each culture) (Hilton & Strutkowski, 2002). The usual canons of good translation, including back-translation, will not do when it comes to research instruments in which items require equivalence in frequency, complexity, cultural symbolism, etc.

Finally, as with bilingual aphasia, there is a need to assess patients in both (or all of) their languages. Based on the results of their study exploring the relations between language skills and emotional/behavioral problems in 50 bilingual children referred for psychiatric services, Toppelberg, Medrano, Morgens, and Nieto-Castañon (2002) strongly recommend that the language skills of bilingual children be fully assessed so as to avoid misattributing their language delays to normal bilingual acquisition processes. They conclude that language disorders and deficits in bilingual skills are closely tied to psychopathology: language skills are inversely associated with severity of delinquency and social, attentional, thought, and aggressiveness problems. Marrero et al. (2002) conclude that, if the languages are differentially affected, mental health assessment must be conducted in both to fully gauge the accuracy and completeness of the information that is gathered. Because each language plays an independent role in the language/psychopathology relation, Toppelberg, Nieto-Castañon, and Hauser (2006) suggest that the two languages cannot be assumed to share a common mechanism or pathway, and conclude that their study supports the need to conduct language evaluations in both languages of bilingual children with psychopathology.

The bulk of the research suggests that the language in which assessment is done has an impact on the manifest expression of psychopathology; as with bilingual aphasia, it is therefore desirable to perform separate assessments in each language (Pérez Foster, 2001): Optimal treatment calls for administration of the mental status exam in both the native and second languages, even for a bilingual who is a proficient speaker of the language of the clinic.

In bilingual aphasia, agrammatic symptoms may be missed when patients are assessed in only one language; likewise, important psychotic symptoms—hallucinations or delusions—may be missed when patients are interviewed in one language only (De Zulueta et al., 2001).

Thus, as with bilingual aphasia, evaluation of bilingual patients should ideally be done in both their languages, but contrary to the assessment of bilingual aphasia, preferably by a bilingual clinician (Oquendo, 1996a). The purpose of the evaluation is not the same: with psychiatric patients, the concern is with the patient's mental state, and how it may be

manifested in each language; in the aphasic patient, the purpose is to examine the specific grammatical competence in each language. In aphasia, for instance, language switching with a unilingual examiner would be symptomatic rather than a result of normal language use, as could be the case with a bilingual interlocutor. In mental diseases, switching may have differential diagnostic and/or therapeutic significance.

As with bilingual aphasia, the manifestations of pathology may be greater in (as in differential recovery) or exclusive to (as in selective recovery and selective aphasia) L1 or L2, or equal in both—as in parallel recovery (Pérez Foster, 2001).

An underlying deficit (e.g., in aphasia: agrammatism; in psychosis: aberrant mental structure or pattern of social behavior) may have different manifestations depending on the person's language and/or culture. For example, in aphasia, what is grammatically correct in one language (e.g., the obligatory use of a definite article in a given context) may be incorrect in another (in which no article, or an indefinite article, is required). The absence of a definite article is ungrammatical in one, its presence is ungrammatical in the other. Likewise, a behavior that is considered the norm in one culture may be considered inappropriate in another, and vice versa. For instance, the French may consider British behavior in general to be "cold," detached, uncaring; the British may consider French behavior in general to be effusive, exuberant, lacking self-control. Thus, a French patient seen by a British clinician may be assessed as manic, erethitic, agitated, perturbed, with inappropriate emotional reactions; conversely, a British patient seen by a French clinician may be considered apathetic, anhedonic, withdrawn, unresponsive, asocial, with blunted affect.[1] It is therefore crucial to distinguish between an underlying deficit and the nature and form of its manifestations in each language, in both aphasia and psychoses. As with aphasia testing, the intent is to detect the underlying deficit; the way it is done is by examining the observable manifestations.

Kalinowsky (1975) reminisces about a patient who lost and regained two previously known languages (the same case as in Kalinowsky, 1982, mentioned earlier, Section 2.2). The author remarks that whereas a return to a previous language is known in aphasia, in electroconvulsive treatment such observations are completely reversible. As a matter of fact, the loss of a language may be reversible in bilingual aphasia too, as demonstrated by the numerous cases of successive recovery. The recovery can be complete, albeit less frequently, in some cases of antagonistic recovery (Paradis & Goldblum, 1989). The pattern is also reversible when psychotic symptoms have been drug induced, as in the cases of anticholinergic toxicity.

The cases related by Bruce (1895) and Kalinowsky (1982) presented earlier (respectively, Sections 2 and 2.2) support the notion of an alternating inhibition of the languages, comparable to alternating antagonism in bilingual aphasia (Nilipour & Ashayeri, 1989; Paradis & Goldblum, 1989; Paradis, Goldblum, & Abidi, 1982).

Some psychiatrists are aware of the similarities between bilingual aphasia and psychotic symptoms. Revitch (1975) reports finding a theoretical explanation of differential language recovery after electroconvulsive treatment in the literature on aphasia in polyglots that

[1] Support for this conjecture is found in a study by Guttfreund (1990) involving 80 adults who had learned either Spanish or English as a second language after the age of 5: significantly greater affective reactions (indicative of levels of anxiety and depression) were observed in the Spanish language condition than in the English language condition, irrespective of whether English or Spanish was the native language of the participants. These results suggest that the responses were related to cultural factors associated with each language rather than age at acquisition.

relates differential recovery patterns. Marcos and Alpert (1976) also draw a parallel between bilingual psychotic conditions and the differential impairments in the two languages of bilingual individuals following acute cerebrovascular accidents (aphasia) or during deteriorating chronic organic brain syndromes (progressive dementias).

2.6. The nature of the contribution of the right hemisphere

The pervasive (inaccurate) belief in the 1970s that a second language is represented (at least to a large extent) in the right hemisphere led Matulis (1977) to test the hypothesis that learning a second language might improve patients' condition, since they would avoid using their left hemisphere, assumed to be dysfunctional in schizophreniform psychoses. Given the often-observed reduced symptoms of schizophrenic patients when their second language is used, it was hypothesized that activation of the right hemisphere would reduce the psychotic manifestations.

Thus, a group of 33 institutionalized male English-speaking chronic schizophrenic patients were taught German over 48 weeks, at the rate of about two 35-min classes per week. The reported general effects on the ward were a calmer population of patients with improved interpersonal behavior and use of language. The author admitted that other factors contributed to the patients' improvement (mainly in attitude and general behavior).

The differences between the behaviors in L1 and L2 in schizophrenia do indeed stem from differences in brain organization and function, as rightfully inferred by De Zulueta (1995). The difference in organization, however, does not stem from differential lateralization of the implicit linguistic competence of the two languages but from the commonly observed and well-documented incomplete internalization of a later-learned language.

If it is indeed the case that there is an association between schizophreniform psychoses and left (perisylvian) temporal lobe dysfunction, and if the improvement is attributable to the learning of a second language, it may be ascribed to the fact that the formally learned L2, being sustained by cerebral areas other than those that subserve implicit linguistic competence (i.e., declarative memory instead of procedural memory for language), does not activate the psychogenic region. If Matulis's study were to be replicated today, this might be verified thanks to the vastly improved technological means at our disposal, possibly including brain imaging. The rationale would be quite different. The behavioral improvement would not be attributable to the right hemisphere's sustaining L2 implicit linguistic competence, but to declarative memory. This would also account for the general observation of reduced symptomatology in bilingual schizophrenics when their second language is used as compared with their first (another element of the rationale for right-hemisphere involvement). It would be compatible with the explanations provided by psychiatrists to the effect that in the second language the speaker may be forced to pay more attention to the language process, and thus may be disengaged from the affective focus of the message. The observation that patients are less psychotic in L2 when they have inadequate knowledge of their L2, or when it has been learned later (De Zulueta, 1984, p. 546), while symptoms tend to be equal in both languages when they were acquired concurrently, lends further support to such an interpretation. So does the fact that dominant bilingual patients often appear emotionally detached when speaking their second language (Marcos, 1976a; Marcos & Urcuyo, 1979), as they invest more affect—

and extra *attentional control*—in *how* they say things and less in *what* they say and show constant concern with wording, grammatical constructions, and pronunciation.

In fact, most psychiatrists implicitly or explicitly recognize the need for greater effort and concentration to process a second language. For example, Laski and Taleporos (1977) ascribe their patient's exclusive use of L1 during the state of toxic reaction to a possible lower level of vigilance—thus implying that greater vigilance is required to process L2, a function indicative of the controlled use of metalinguistic knowledge. The second language remains intellectualized and somewhat distanced from feelings (Rozensky & Gomez, 1983). Marcos (1976a, 1976b) considers that communicating in the second language requires more elaborate mental work than communicating in the first language: extra cognitive and attentional demands are placed on the low-proficiency second language speaker. The second language encoding process (involving consciously monitoring syntax and phonology, in addition to vocabulary) is considered more intricate. Peck (1973) investigates the relationship of disease and other stress factors with second language (L1 seems less vulnerable to such factors). The significant increase in stress-associated hand movements produced by patients during L2 interviews is interpreted as reflecting second-language encoding *efforts* (Grand, Marcos, Freedman, & Narroso, 1977; Pitta et al., 1978).

As a matter of fact, all the clinical observations that led to the speculation about an extended use of the right hemisphere for the late-learned L2 are accounted for within the declarative/procedural memory framework (Paradis, 1994; Ullman, 2001). In the absence of valid empirical evidence, whether clinical or experimental, in favor of a greater participation of the right hemisphere (Paradis, 1990, 2003), it is reasonable to assume that the language dissociations described in psychiatry, like those described in aphasia, have their neural underpinning in the differential participation of cerebral systems for languages *acquired* (from birth) and those *learned* (later in life). The additional direct connection between native languages and the (emotive) limbic system during language acquisition (De Zulueta, 1990; Lamendella, 1977) contributes to making L2 a more detached medium of communication.

2.7. Bilingualism and biculturalism

A number of psychiatrists adopt the general view of the Sapir-Whorf hypothesis inasmuch as they consider every language to be a special way of looking at the world and interpreting experiences. They are particularly interested in the unconscious assumptions about the world that are associated with each different language of a bilingual speaker, to the extent that belief systems and cultural attitudes are relevant to an accurate diagnosis and to the therapeutic process (Amati-Mehler, Argentieri, & Canestri, 1993; Baxter & Cheng, 1996; Clauss, 1998; Hong, Chiu, & Kung, 1997; Hong, Morris, Chiu, & Benet-Martínez, 2000; Javier, 1989, 2007; Marcos, 1976b; Marcos, Alpert, et al., 1973; Marcos, Eisma, & Guimon, 1977; Marrero, 1983; Pérez Foster, 1996; Ramírez-Esparza, Gosling, Benet-Martínez, Potter, & Pennebaker, 2006; Rieber & Vetter, 1995; Torrey, 1986). Language differences in cognitive organization may have an impact on symptom expression (Pérez Foster, 2001). Cultural norms and the language in which developmental moments are encoded influence the patient's worldviews and psychological structures (Javier, 1989).

According to Clauss (1998), the role of the psychopathologist is to be conversant in the particular language within which their patients experience their worlds. Not only

client–therapist language but also ethnicity match are important variables affecting treatment (Flaskerud & Liu, 1991).

The study by Ramírez-Esparza et al. (2006) shows the tendency of bilingual, bicultural individuals to change their interpretations of the world in response to cues in their environment. The authors suggest that such cultural frame switching (Hong et al., 1997) can affect not only bilingual persons' attitudes and values, but also their personality. For example, they found that bilingual individuals show different personalities in English and Spanish consistent with differences between the two cultures. In Bond and Yang's (1982) study, Chinese bilinguals who responded to a questionnaire in English endorsed more values and norms associated with the English-speaking world than did Chinese bilinguals who responded to the same questionnaire in Chinese.

Language-dependent changes in bilinguals' personalities when they switch from one language to another (a cultural frame switch) had been reported before, as evidenced by the *Thematic Apperception Test* (TAT) results of bilinguals required to tell stories about the same pictures at a French session and at an English session (Ervin, 1964). For three of the stimulus situations, different attitudes toward a given circumstance were statistically significant: a given individual's attitude shifted at the French and English sessions. Ervin's rationale is that spoken language is acquired in a social setting and that speakers in different language communities will have different things to say: learning a language carries with it learning of content. Interactions in a later-learned language do not have the same emotional valence, metaphors and meanings as in the native language (Katsavdakis, Sayed, Bram, & Brand Bartlett, 2001).

Our memories for the events of our own past are uniquely shaped by the sociocultural context in which we live and by the language we speak. Different cultures provide their members with different ways of conceiving of the self and emotion, the self and its relation to others. Recall of memories from youth and childhood in the first language is more detailed and emotionally intense than their retrieval in the second language learned as an adult (Schrauf, 2000, 2001). Affectively charged words and taboo words associated with particular emotions early in life (especially when they have remained so for a long time) elicit a greater autonomic activity (faster heartbeat, sweating) in speakers' L1 than their L2 (Harris, Aiçiçegi, & Gleason, 2003). Personal events recalled in the language of the actual experience show different content organization and detail and are more vivid than when the same event is recollected in the other language (Javier, Barroso, & Muñoz, 1993). Each language is unique in evoking the relational experiences and social-contextual environment encountered at the time of its original acquisition and use (Pérez Foster, 1996). The processing of two linguistic codes may impact on the extent and the degree to which memories and associations can be expressed depending on the language used (Javier, 1989).

Language itself primes the bilingual's culture-specific values, attitudes, and memories (Ramírez-Esparza et al., 2006). Different cognitive and emotional activities can be activated by, and are associated with, the two languages (Javier, 1989). The first or second language can each function as the reference language of an experience depending upon the linguistic context in which the experience occurs (Javier et al., 1993).

Different sets of associations, memories, and affective responses are reported to be elicited in the participants in bilingual experiments depending on the language used (Javier, 1989). Words referring to emotional states elicit very dissimilar associations in the two languages (Kolers, 1963; see also Pavlenko, 2006, 2008). This does not necessarily entail

that memories are "stored separately in the language the subject used to define the experience to himself" (Kolers, 1963, p. 300): any stimulus associated with a memory (smell, sounds, atmosphere, including the language used, provided that it has some particular relevance) will activate the recollection of an event, in a Hebbian cell-assembly-type process (Hebb, 1949). As such, L1 may indeed have more connections with early memories, and later memories may have stronger connections with either L1 or L2, depending on the circumstances of the acquired memory. A particular language may be associated with a particular person, or place, or event. Much of the time, however, when language is not particularly relevant, the very words that were used to convey the information—even the language in which it was conveyed if there is no specific cue to that effect—are not remembered (e.g., if, in a bilingual city one heard something on the car radio, assuming one habitually listens to both English and French news in Montreal, Dutch and French news in Brussels, or Catalan and Spanish news in Barcelona). Language may thus be considered not so much the "bearer of emotions" (Javier, 1989, p. 90) as one of several associations (neural connections) with particular memories.

The relationship between language and culture is inextricable and jointly bound to psychotherapeutic processes (Clauss, 1998). Concealed in the structure of each different language is a whole set of unconscious assumptions about the world and life in it (Kluckhohn, 1964). The possession of more than one language may imply the possession of more than one Weltanschauung. The language spoken in a given community will affect this community's way of looking at and analyzing the world; second-language learners have, in addition to their first language, a given social personality, social attitudes, customs, traditions, and an ethical or moral code of sorts, a behavior code, all of which relate to their native language and background (Rieber & Vetter, 1995). Culture and language are intimately interdependent (Schrauf, 2000). Bilingual individuals possess dual templates through which they shape and organize their world; they are efficient and quite expert at changing perspective or shifting their approach, as the situation may demand (Pérez Foster, 1996).

Therapists tend to classify the meaning and value of symptoms in accordance with their own cultural context (Ruiz, 1982). Whenever a therapist from one culture diagnoses and prescribes treatment for a patient of another culture, there is an inherent probability of professional misjudgment (Torrey, 1986). As mentioned earlier, behavior defined as a symptom of mental illness by professionals in one ethnic group may be culturally accepted in another group (Fitzpatrick & Gould, 1970). Without minimizing the importance of biological approaches in treating the mentally ill, Ruiz (1982) maintains that an understanding of the social setting of any ethnic group is of paramount importance.

To the extent that psychotherapy is verbal, it is culture bound and is not universal in the way that penicillin is for infections or insulin is for diabetes (Torrey, 1986). Even when the illness is treated with pharmacological agents, the therapist and the patient must share a common worldview, especially common thoughts on what causes the illness (whether angered evil spirits or a biochemical abnormality). Because the psychiatric disease and its treatment are both determined by the same culture process, a particular form of treatment developed in a particular culture is only, or at least most, useful to persons of that culture (Kline, 1969).

Seemingly equivalent lexical items may represent only partial overlaps (Herbert, 1984). Not only are the concrete denotative meanings of words (things, objects, events) not identical in their translation equivalents (Paradis, 1997) but emotions cannot be expressed

equally well in different languages (Pavlenko, 2008). This is why affective symptoms are most sensitive to cross-cultural misinterpretations (Cuellar, 1982). Translation equivalents are linked to a different string of associations, connotative meanings, metaphorical extensions, and affective accompaniment (Marcos, 1976b; Marcos & Alpert, 1976; Oquendo, 1996a; Pérez Foster, 1996). Balint (1979) draws attention to the fact that a cluster of highly individual associations surrounds each word and is different in every language—and he adds: different even in varying human relationships using the same language.[2]

Bilingual patients have been found to display different characterological traits (Findling, 1969), to recollect different sets of past experiences (Ervin, 1964), to tell their story differently (Katsavdakis et al., 2001), and to experience a different set of identity (Marcos et al., 1977), depending on which of their languages they speak. Exploring the phenomenon of experiential and psychic duality in bilingual speakers, Pérez Foster (1996) proposes that they may possess different representations of the self that are organized around their respective languages.

But although interrelated and interdependent, bilingualism and biculturalism are two distinct phenomena (Marrero, 1983, p. 59). One may be bilingual without being bicultural if one has not lived in the L2 country. Speakers of the same language may partake of different cultures (e.g., French in France and in Quebec). Speakers of different languages may, to a great extent, belong to the same culture (e.g., Flemish and French speakers in Belgium).

As pointed out by Hsia and Tsai (1981), progress in civilization and society influences the development of human thought and character; language and behavior patterns will vary accordingly. Consequently, features of abnormal mental activity will not remain the same. Clinical characteristics of psychoses are influenced by sociocultural changes over time. These altered clinical manifestations are not specific disease entities caused by sociocultural variables, but variations in behavioral responses to cultural factors.

For example, among a number of symptoms secondary to the sociocultural changes in China, Hsia and Tsai (1981) report the frequent occurrence of patients who, with the onset of their illness, change from speaking in their native dialects to speaking Mandarin, resuming the use of their native dialect after remission of the disease. (It is noteworthy that Mandarin, for these patients, is a second language learned in school; thus, it is possible that they switch to the more detached language, like many other patients elsewhere. Nevertheless, the point is well taken, and the authors present many other examples of previously unknown psychotic manifestations induced by drastic social changes.)

A number of authors (Edgerton & Karno, 1971; Fitzpatrick & Gould, 1970; Kline, 1969; Marcos, Alpert, Urcuyo, Kesselman, & Alpert, 1973) have pointed out the need for mental health professionals who possess not only fluency in the patient's second language but also a sensitive understanding of that culture. Cultural nuances may be encoded in language in ways that are not conveyed in translation (Oquendo, 1996a). It is difficult but necessary to discern whether an immigrant patient's performance reflects pathology or an expression of culture-specific behavior (Pérez Foster, 2001).

In a study on the possible differential influence of the language used in psychotherapy on the outcome of treatment, depending on the patient's degree of acculturation, Gómez,

[2]A reminder that there is nothing in the bilingual brain and behavior that does not have a counterpart in the unilingual's (Paradis, 2004, 2007).

Ruiz, and Laval (1982) found that their patients' culture values, belief systems and norms existed side by side, sometimes in peaceful coexistence, sometimes in conflict. Whereas it has been reported that level of acculturation strongly influences patients' psychological problems and expectations (Arce & Torres-Matrullo, 1978), Gomez et al. report that both acculturated and unacculturated groups improved, regardless of which language was used in psychotherapy. Switching for defense purposes was noted in both groups with equal frequency.

According to Marrero et al. (2002), therapy ought to be conducted in the stronger language in order to best tap internal cognitive processes. Clients' ability to express emotional and psychological experiences may vary widely across their languages. Treatment may therefore need to be bilingual in order to capitalize on the strengths of both linguistic systems. Use of one language in therapy may block access to some mental conflicts and affective processes.

Some principles of psychotherapy are universal but their contents are culture-bound. Cognitive neuropsychologists focus on the process: how language and thought are represented and processed; for psychotherapists it is the content of thought that is important (Torrey, 1986). The differences in cognition between different groups of people have to do, not with thought processes, but with thought content. The similarity of thought process is due to the physiologically finite ways in which the human brain can respond. In the way that the underlying cause of a particular aphasia symptom is the same for all, but that their manifestations depend on the structure of each language, the manifestations of mental illness are "inextricably bound to each particular culture" (Torrey, 1986, p. 28). Therapists too are culture bound. This is why they risk to misdiagnose the condition of patients from a different culture or be ineffective in the therapy they provide.

3. The need for bilingual mental health professionals

It is estimated that, worldwide, over 90 million people live outside their country of birth. Large Western cities are now home to many different minority ethnic communities (Jones & Gill, 1998). Psychotherapists are dealing more and more with people whose first language is not the language of the community in which they live: Bilingualism can no longer be ignored (Ali, 2004). Not surprisingly, a sizeable portion of the mental health literature devoted to bilingualism stresses the need for bilingual professionals.

It has been convincingly argued that the lack of ability to communicate in the native language of patients presenting with acute disorders can be a source of danger for the patient: it may impugn the accuracy of psychological assessment, which, in turn, is a prerequisite for the delivery of effective psychopharmacological and psychotherapeutic treatment (Malgady & Costantino, 1998). It can directly or indirectly affect an appropriate diagnosis of these patients (Ruiz, 1982). Therapists' lack of full command of L2 can introduce significant distortions in patients' psychiatric evaluation (Marcos, 1976a). The dearth of fluently bilingual health professionals contributes to misunderstandings and poor diagnoses (Fitzpatrick & Gould, 1970). The language used by bilinguals in clinical interviews may affect the reliability and validity of the clinical picture obtained (Segovia Price & Cuellar, 1981). In addition, to the extent that language influences clinical judgment in psychiatric interviews, it may also affect the validity of research findings.

A language difference between patient and therapist exerts a powerful negative influence on the effectiveness of psychotherapy. Psychodiagnosis, assessment of severity, content and pattern of speech, and perception of mental illness vary depending on the patient's and the therapist's degree of familiarity with each other's language (Bradford & Muñoz, 1993). Moreover, the results of a study of the rehabilitation of chronic schizophrenics conducted by Burke, Lafave, and Kurtz (1965) indicate that one of the factors that may be involved in chronicity is the fact that speaking a language other than that spoken by staff prevents adequate communication and understanding.

Conversely, a therapist who can use the patient's mother tongue is judged to have distinct advantages in the treatment of bilingual patients (Carlson, 1979). Therapists who match the bilingualism of their patients have special resources at their disposal (Marcos & Alpert, 1976), such as the ability to switch from L1 to L2 in order to avoid overly intense emotion arousal, or the reverse when it is felt necessary to do so, given that speaking in a foreign language produces affective detachment in the patient (Marcos, 1976a). The prognosis for a successful outcome may depend on the language of treatment and the strategic handling of the two-language system (Marcos & Alpert, 1976). The switch in the language of interviewing affects the content as well as the paralinguistic component of verbal communication (Marcos, 1976a). Bilingual interviews elicit the most information; interviews in the second language alone elicit the least information (Malgady & Costantino, 1998).

In addition, bilingual health workers remove the need for a third party to be involved and are the ideal option for most patients. Assessment in the language with which the client is most comfortable might reduce assessment errors; hence, ideally, clinicians who are fluent in both the client's languages and sensitive to the cultural context underlying the client's use of each one should perform assessments of bilingual clients (Cofresi & Gorman, 2004; Oquendo, 1996a). Indeed, a bilingual therapist for every bilingual client would seem to be the ideal condition (Guttfreund, 1990). But this is not always possible. Bilingual health workers are few and will never be universally available (Phelan & Parkman, 1995).

For this reason, Phelan and Parkman (1995) consider four possible ways to cope with the situation: Bilingual health workers, trained interpreters, friends or relatives, and untrained volunteers, in that order of preference. Bilingual health workers are the ideal option but are not easily available. Trained interpreters are the next best option. However, distortions by interpreters may result in the incorrect evaluation of the patient's mental state. Translators often alter the symptomatology being expressed by the patient, as well as the questions asked by the clinician (Marcos, 1979). They tend to limit their translation to *what* the patient says, neglecting *how* the patient says it, that is, ignoring paralanguage, from intonation to gestures (Marcos, 1979). Culture is encoded in language in a way that cannot be uncovered through direct translation of content but must be understood by attending to how and when language is used (Oquendo, 1996a). Both client and counselor might become frustrated with the extra time it takes to translate information (Altarriba & Santiago-Rivera, 1994). In any case, to avoid undesirable outcomes and improve the accuracy of translations, the interpreters should be told if a patient is psychotic and likely to say things that might not make immediate sense.

Options other than a professional interpreter may present further serious drawbacks. Without training, volunteers may not be adequate for a number of reasons, from lack of empathy to a poor grasp of the language. In particular, lay interpreters may lack the necessary translation skills or clinical knowledge to accurately describe the client's mood

or affect. Phelan and Parkman (1995) draw special attention to the disadvantage of using friends and relatives to interpret medical consultations and especially to the importance of not using children (see also Smart & Smart, 1995). For a variety of both well-meaning and sinister motives, someone close to the patient may not be faithful in their translation, or the patient may be inhibited from discussing embarrassing issues in front of relatives (Marcos, 1979). The information obtained through an untrained interpreter from a psychiatric patient speaking a language other than that of the clinician can be inaccurate and misleading: symptoms may be misinterpreted and either minimized or exaggerated (Vasquez & Javier, 1991). Some interpreters may actually answer the questions posed by the clinician to the patient without actually asking the patient (Marcos, 1979)!

Baxter and Cheng (1996) consider that the use of an interpreter in psychotherapy can only be justified if there is a scarce supply of therapists who speak a particular language and a plentiful supply of competent interpreters. In their view, the use of an interpreter is valid only as an alternative to no therapy. One of the problems introduced by the use of an interpreter (however competent) is that the addition of a third person into the therapeutic relationship converts the usual clinician–patient dyad into a triad, and group dynamics come into play (Westermeyer, 1990). These group dynamics act as resistance to the therapy. Baxter and Cheng also point out that an accurate translation, with the same full and accurate meaning in the second language as in the first, is difficult to achieve. The interpreter needs to convey both the denotative and connotative meanings of the words used. At times, the different worldviews of the two cultures make accurate translation impossible. In addition, translators without therapeutic expertise may filter out material that they consider unimportant, thus distorting what is said. Schmidt (1965) goes so far as to suggest that it is not necessarily true that a poor interpreter is better than none at all.

The public also favors bilingual staff over interpreters (Bhui, 1998). Based on a sample of nearly 3000 clients served in a mental health system of the western region of Melbourne, Australia, Ziguras, Klimidis, Lewis, and Stuart (2003) assessed the effects of matching clients from a non-English-speaking background with bilingual, bicultural clinicians. Their results show that the benefits in matching clients with psychiatric case managers include reduced need for crisis intervention and, for clients from some ethnic groups, fewer interventions. These Australian results support findings of the effectiveness of client–clinician ethnic matching reported in the United States (Flaskerud & Liu, 1990, 1991; Jerrell, 1995; Snowden, Hu, & Jerrell, 1995; Snowden, Masland, Ma, & Ciemens, 2006). Clauss (1998) recommends that training facilities at least recognize the need for both culturally and linguistically relevant training. Professionals working with bilingual individuals need to complement their knowledge of specific cultural issues with the psychological processes that all bilingual speakers share (Javier, 2007). Guarnaccia and Rodriguez (1996) argue that mental health services need not only to be sensitive to the expressions and needs of culturally different populations, but to be skilled in serving those populations as well. Working with translators is a special clinical task that requires specific skills on the part of the psychiatrist, who must remain in charge of the interpreter and the interview process when conducting cross-language interviews (Westermeyer, 1990).

All of the above-mentioned considerations regarding the need for bilingual mental health clinicians are an implicit (and sometimes explicit) acknowledgment of the neurofunctional specificity of each language and its individual connections with the conceptual system (on the one hand) and with emotions (on the other).

4. Psychotic phenomena viewed within a neurolinguistic theory of bilingualism

Very few cases of bilingual psychotic phenomena have been described in recent years. The bulk of the literature of the past decade tends to emphasize the need for bilingual, bicultural mental health professionals or describe programs to cope with the situation—but does not report the form of patients' psychotic manifestations or propose hypotheses to account for them.

It cannot be because the general level of schooling has increased in the population at large, given that some of the earlier cases of bilingual psychotic symptoms were reported to occur in highly educated individuals. Nor can it be because drugs have become more efficacious and thus help eliminate the symptoms, since symptoms must have been present in the first place or no medication would have been prescribed. Nor has the overall incidence of schizophrenia diminished. In fact, due in part to the increasing number of political refugees and displaced populations from war-torn areas, situations known to trigger anxiety and other mental distress, the number of bilingual individuals at risk is on the rise. Actually, the repeated pleas for bilingual clinicians found in the recent literature are a direct result of the increased incidence of bilingual individuals in need of psychiatric help. So, how is it that we find no case descriptions?[3]

Could it be that no plausible neuropsychological theory that would be compatible with the various phenomena observed in the clinic has been identified? In the study of bilingual aphasia, researchers first attempted to ask the question "Why does a given patient recover French over Arabic, and not the reverse?" and proposed different types of answers, ranging from "the language recovered first or best is the first acquired" (Ribot, 1881), to "the most familiar" (Pitres, 1895), "the most emotionally relevant" (Minkowski, 1928), etc. (see Paradis, 1977, for an exhaustive list). However, they did not ask the more fundamental question: "How is it possible for one language to be affected and not the other?" Pitres (1895) had hinted at a possible direction: when one language is not available, it is not because its cerebral substrate has been physically destroyed but because it has been "shaken" (*ébranlé*). In contemporary terminology, we would say that one of the languages has been inhibited. This implies that each language is selectively susceptible to inhibition, and hence must be sustained by a distinct substrate.

Similarly, researchers in bilingual psychiatry have first asked why this language rather than that, why the native language rather than the second language (or the reverse), before having an answer to the underlying question of how it is possible for one language to be affected and not the other. As with bilingual aphasia, the explanation will depend on whether the two languages were acquired in the first years of life or whether one was learned later.

On the one hand, the fact that the nature and structure of the representation of two languages are closer to one another than either is to any other neurofunctional system (music, arithmetic, etc.) leads to the inference that they are subsystems of the larger language neurofunctional system, the subsystems hypothesis (Paradis, 2004). On the other hand, the research on declarative and procedural memory points to the different nature of L1 and L2 neural substrates. These two constructs add to the complexity of the already heterogeneous picture of the bilingual phenomenon, but cannot be ignored.

[3]Contrary to the increasing number of reports on bilingual aphasia: as many cases of bilingual aphasia were reported between 1990 and 2000 as had been published in the 130 years between 1843 and 1973.

On one side we have the situation of two or more languages acquired early, represented as subsystems of the language neurofunctional system, sustained by procedural memory (the implicit linguistic competence for each language). But we also have cases in which procedural linguistic competence sustains the language acquired from birth, whereas a second language is deliberately and consciously learned later. Through extensive practice, such a learned language may eventually, at least in part (to different extents for each component of the grammar, i.e., prosody, phonology, morphology, syntax, and grammatical properties of the lexicon), acquire some implicit linguistic competence. The explicit metalinguistic knowledge learned over the years continues to be sustained by the learner's declarative memory,[4] while the portion of L2 implicit competence acquired through practice forms the second language's neurofunctional subsystem. Until such a second subsystem has been acquired in full (which rarely if ever happens), the second language has a subsystem containing an incomplete L2 implicit competence and a set of metalinguistic knowledge on which speakers must rely to fill the gaps in their L2 (automatized) implicit competence.

This model of subsystems within the procedural/declarative framework, which accounts for all observed phenomena in bilingual aphasia, and successfully predicted the loss of an L2 in amnesia (Paradis, 1994) that had not yet been reported, may also account for the various types of language dissociations in psychoses and, as we shall explore below, dementias.

In addition, the three-store hypothesis (Paradis, 2004) postulates a thought/language interface for each language subsystem, and this fits the observed dissociations of schizophrenic symptoms. The reliance on the metalinguistic knowledge of an L2 (with the consequent deployment of attention on, and control over, form) also fits nicely with the psychiatrists' observation that L2 requires more effort.

5. Huntington's and Parkinson's diseases in bilingual individuals

Huntington's disease and Parkinson's disease are progressive neurodegenerative disorders. Both diseases involve deterioration of subcortical structures, the caudate nucleus in Huntington's disease and the substantia nigra in Parkinson's disease, as well as disrupted functioning of other cortical and subcortical areas with which these structures connect (Cazzato & Bava, 2003; Moretti et al., 2001, 2002; Murray, 2000). Individuals with Parkinson's disease have their *procedural* competence impaired (Saint-Cyr, Taylor, & Lang, 1988; Ullman et al., 1997; Zanini et al., 2003). Deficits are not necessarily in implicit memory per se, as measured by priming or picture fragment experiments (Appolonio et al., 1994), but in procedural tasks (e.g., phonology and syntax). For example, in addition to speech problems such as difficulties in articulation, voice quality, and intensity (Cohen, 2003), Parkinson's disease patients also tend to produce a smaller proportion of grammatical sentences (Murray, 2000), and exhibit deficits in comprehension of complex syntactic forms (De Vita et al., 2001). Patients with Huntington's disease also tend to produce shorter utterances, a smaller proportion of complex grammatical utterances, a larger proportion of simple sentences, and fewer embeddings per utterance than non-brain-damaged peers (Murray, 2000).

[4]At least until such time as the items become unavailable through lack of rehearsal, like any other piece of information in declarative memory, such as an unused telephone number.

Not much can be said about bilingual individuals with Huntington's disease because very little has been published so far. One can only venture predictions based on what we know about the disease. It affects the basal ganglia and consequently triggers deficits in procedural memory (Butters, Wolfe, Martone, Granholm, & Cermack, 1985; Bylsma, Brandt, & Strauss, 1990). More specifically, patients with Huntington's disease are impaired in their application of linguistic rules but spared in word processing (Teichmann et al., 2005). This suggests that declarative memory is better preserved than procedural memory for language. We may therefore expect that the native language will be more impaired than a later-learned language. Given that, independently, patients are reported to have task-set switching deficits (Aron et al., 2003), we may also expect that they will have difficulty switching from one language to another, as do patients with aphasia subsequent to basal ganglia damage (Abutalebi, Miozzo, & Cappa, 2000; Mariën, Abutalebi, Engelborghs, & De Deyn, 2005).

Bilingual Parkinsonian patients have actually been shown to exhibit greater syntactic impairments in their native language than in their second language (Zanini et al., 2004). Also, Yazawa, Kawasaki, and Ohi (2003) describe a bilingual Japanese–English patient whose micrographia (a common and well-known symptom of Parkinson's disease) was more severe in his written Japanese (his native language) than his written English (his second language). The patient had never lived in an English-speaking country and was not considered bilingual. It would thus appear that his Japanese writing was more impaired because it was more automatic (i.e., less controlled) than his English writing. Both reports are consistent with the prediction that diseases known to affect procedural memory will result in greater impairments in L1 than in languages learned subsequently (Paradis, 2004). Obviously, more research is necessary before anything conclusive can be said about either Huntington's or Parkinson's disease in bilinguals.

6. Alzheimer's dementia in bilingual individuals

Alzheimer's dementia is a neurodegenerative disease characterized by progressive cognitive deterioration together with declining activities of daily living and neuropsychiatric symptoms. Semantic difficulties occur early on in the disease process, whereas syntax and phonology remain relatively intact until later stages (Bayles, Tomoeda, & Trosset, 1993). Low scores on the verbal fluency test (i.e., difficulty in producing words from a specified semantic field) is one of the characteristics of Alzheimer's disease, with problems in this domain occurring very early in the disease process (Kempler, 1995).

For example, in a study by de Picciotto and Friedland (2001), unlike participants with Alzheimer's disease, healthy elderly bilingual controls did not make use of code-switching strategies in a verbal fluency task, and there was some relationship between age of appropriation, pattern of use, and verbal fluency scores.

Many data conspire to demonstrate an early deterioration in those aspects of language that are sustained by declarative memory, with relative preservation of linguistic structure until the most advanced stages of the disease (Melvold, Au, Obler, & Albert, 1984): Phonology, morphology, and syntax remain largely intact. Similarly, psychotic patients are reported not to be impaired on implicit verbal learning (irrespective of dosage of neuroleptics, anticholinergics, and benzodiapines) but significantly impaired in explicit learning (which does correlate at least with benzodiapines (Schmand, Kop, Kuipers, & Bosveld, 1992).

People with Alzheimer's disease also frequently have pragmatic deficits from early on in the illness. For example, they can have problems selecting the appropriate language and refraining from switching languages inappropriately (De Santi, Obler, Sabo-Abramson, & Goldberger, 1990; Hyltenstam & Stroud, 1993; Obler, De Santi, & Goldberger, 1995). In Friedland and Miller's (1999) study, the more prominent pattern of language mixing was L1 utterances into L2 talk, and this was more pronounced in speakers who were less proficient in their second language, adding to the evidence that speakers rely extensively on declarative memory when using their L2. Bilingual speakers with Alzheimer's disease may use the wrong language for the setting or interlocutor or produce what appears to be an inappropriate mixture of their two languages (Friedland & Miller, 1999).

The ability to maintain fluency in more than one language decreases with advancing age. More specifically, a language appropriated in adulthood tends to become less fluent, more controlled, and prone to errors of a type that were not committed before. These effects found in normal aging bilingual persons can be exacerbated in those who develop dementia. In a study of 51 patients with progressive memory or cognitive problems, conducted by Mendez, Perryman, Pontón, and Cummings (1999), irrespective of the patient's native language (11 different languages), and despite differences in age of appropriation of L2 (English) and educational level, all caregivers reported decreased use of L2 and a tendency for words and phrases from the native language to intrude into conversational speech in L2.

6.1. Patients' language choice and code-switching in dementia

De Santi et al. (1990) examined language choice (the ability to speak the appropriate language for the interlocutor) and code-switching in four bilingual patients with senile dementia of the Alzheimer's type, respectively at stages II (patient B), III (patient D), between III and IV (patient E), and IV (patient C) of the severity scale.

With respect to language choice, based on the performance of one subject (C, the most impaired), the authors surmise that the ability to correctly make language choices reflects the overall stage of demented language decline. (Note, however, that the only patient who consistently chose the appropriate language, whether speaking to the unilingual (English) or the bilingual (English–Yiddish) examiner, was not actually the least severely affected.)

With respect to code-switching, the authors report that all patients were able to code-switch appropriately with the bilingual examiner. On the basis of patient C's making more inappropriate code-switches than E (though C never violated Poplack's (1980) equivalence constraint (i.e., switches at junctures where the structure of both languages is equivalent, resulting in grammatical segments in each language) whereas E produced two violations), the authors conclude that this indicates a dissociation between the linguistic and pragmatic appropriateness of code-switching. In order to account for the fact that both patients C and E copiously violated the functor constraint (i.e., the use of nothing but a function word from one language in a sentence in another language) de Santi et al., invoke Nishimura's (1986) proposal that this constraint does not apply between structurally distant languages. However, on the one hand, Yiddish is far from being as structurally distant from English as Japanese is (in fact, it is closer than Poplack's English and Spanish examples), and on the other hand, Nishimura's subjects (second-generation Japanese) appeared to be on the way to Japanese attrition, resulting in the use of a fused Anglo-Japanese rather than code-switching.

The authors conclude that, as with aphasic bilinguals, the language problems may be exhibited differentially in each of the demented patient's languages. Problems with language choice and code-switching did not necessarily occur in both languages for all patients. Only C, the most demented patient, exhibited problems with language choice and code-switching with both examiners. In this sample, there is a strong correlation between severity of dementia and problems of language choice and code-switching.

Hyltenstam and Stroud (1989) investigate language choice and code-switching in two Alzheimer's patients, both described as premorbidly highly proficient bilinguals. In one (G.M.), the native language (German) was better preserved than the second language (Swedish) learned later in life, in spite of his having lived in Sweden for the latter half of his life. In the other patient (K.L.), who had acquired a second language in early childhood, there is no clear evidence that she performed better in either language, even though her second language had been used only sporadically for the past 35 years. One of the manifestations of the better preservation of G.M.'s L1 was his frequent use of L1 elements in his Swedish discourse, but not the reverse. K.L. did not show any such tendency.

One may interpret G.M.'s unidirectional code-switching as indicating that his L1, being automatic, is accessed faster than his L2, again suggesting that the second language is sustained by declarative memory, at least to a much greater extent. Grammatical code-switching constraints are said to be retained in advanced Alzheimer's disease, even by speakers who never lived in a context where code-switching was frequent (Hyltenstam and Stroud, 1989). This suggests that grammatical constraints on code-switching are part of the bilingual individual's implicit linguistic competence.

6.2. *Pathological translation behavior*

De Vreese, Motta, and Toschi (1988) report on a polyglot speaker with pre-senile dementia of the Alzheimer type who exhibited both compulsive and paradoxical translation behavior. Both behaviors have previously been described in the literature on bilingual aphasia. Unpredictably, their patient was able to translate correctly and without hesitation from his better-preserved native Italian into French, but not the reverse. One month later, his ability to translate only in the paradoxical direction had not changed. Both bilingual aphasic patients reported by Paradis et al. (1982) could also translate, accurately and without hesitation, difficult sentences from their fluent language into the one in which they could not find words to speak spontaneously. Yet they too could *not* translate the simplest sentence from the language they understood into the language that they could speak fluently at the time.

De Vreese et al.'s (1988) Alzheimer patient's compulsive translation behavior was characterized by immediate translation of his own utterances and those of others. On a number of occasions, he would even automatically translate Italian (his native language) into German and English, two languages in which he could neither speak spontaneously nor translate upon request. Such dissociation between automatic (i.e., spontaneous, unsolicited) translation of entire phrases and short sentences and the inability to translate upon request has also been described in bilingual aphasic patients (Perecman, 1984). A deaf woman, bilingual in British Sign Language and English could not sign nor speak but occasionally gave echolalic translations of BSL signs (Marshall, Atkinson, Woll, & Thacker, 2005). Goldstein's (1948) Swedish–English bilingual aphasic patient could change from Swedish to English when somebody addressed her in it (an unreflecting, automatic

operation), but was not able to shift voluntarily from one language to the other when asked to do so.

In other words, as the corollary to Murphy's Law would predict, the language behavior of patients with Alzheimer's disease much resembles aphasic performance. Even though the etiology and pathogenesis underlying the observed linguistic behavior in post-stroke aphasic and demented populations are not the same, some symptoms exhibited by the two populations may be identical. The type of dysfunction that can occur is determined by the structure of the various neurofunctional components of the language systems. Symptoms of aphasia are an impairment of language structure and usage. Symptoms of psychotic disorders are impairment at the level of the thought/language interface. In Alzheimer's disease, the dissociation between implicit linguistic competence and explicit metalinguistic knowledge is in the same direction as in amnesia, as is the better recovery of L1 over L2; it is the reverse of bilingual aphasia where implicit linguistic competence is more affected than explicit metalinguistic knowledge—as expected in a neurolinguistic theory of bilingualism (Paradis, 2004), given the locus of the brain damage in each case.

A parallel between bilingual aphasia and bilingual Alzheimer's dementia is made by Hyltenstam and Stroud (1993): the observation that their subjects were still able to understand a language they could hardly produce is taken as one piece of evidence that, like the temporarily or permanently inaccessible language in bilingual aphasia, it is not destroyed, but inhibited. The better preservation of production than comprehension would be predicted by the activation threshold hypothesis (Paradis, 2004).

They also conclude that an incompletely acquired language has a lower degree of automatization and relies more on controlled processing: subjects who have not premorbidly acquired their L2 at a sufficient level require more processing capacity for the use of this language. In other words, the poorer the L2, the more the speaker must rely on declarative, controlled processes.

6.3. *The impact of age and manner of L2 appropriation*

Age and type of appropriation are often cited as crucial variables, but it has not always been clear why. In the psychiatric literature of the 1970s and 1980s—and in more recent publications that still uncritically rely on these previous studies (e.g., Santiago-Rivera & Altarriba, 2002), on the basis of invalid (and therefore unsurprisingly contradictory) experimental data, and of preposterous claims of a higher incidence of crossed aphasia in bilingual aphasic patients, it was believed that the difference between L1 and L2 was caused by the differential lateralization of the late-learned language system (Bruce, 1895; De Zulueta, 1984; De Zulueta et al., 2001; Heinemann & Assion, 1996; Hughes, 1981). To be sure, as stated by Santiago-Rivera and Altarriba (2002), various structures in the brain play a differential role in the processing of a late bilingual's two languages, but not, as assumed, because "age of acquisition, dominance, proficiency and so forth seem to play a role in the degree of hemispheric lateralization that occurs with a first and second language" (p. 31). This explanation could not account for the impairments found in dementia of the Alzheimer's type, given that the cerebral damage is not lateralized in that case.

Within the framework of a neurolinguistic theory of bilingualism (Paradis, 2004), age and type of acquisition do indeed bear on the neuropsychological organization of verbal communication, but for a different reason. Implicit linguistic competence in each language

is subserved by the same neural substrates as those of unilingual speakers of the respective languages. For both languages, metalinguistic knowledge is subserved by a common neural substrate, except that in late-learned languages, at least in the first stages, only metalinguistic knowledge is appropriated, and speakers will continue to rely on metalinguistic knowledge for verbal communication in L2 to a greater extent until implicit linguistic competence is acquired for that language. However, L2 implicit competence will only rarely, if ever, reach the same dimension as in L1.[5]

Granted, at first, the quantitative difference is considerable, and tasks that are automatically accomplished by implicit linguistic competence (e.g., the production of a sentence) are deliberately conducted under executive control. Such a task involves the processing of prosody, phonology, morphology, and syntax, each of which may eventually be replaced by automatized procedures (over time, in the reverse order), and some of which may never be automatized. The differences observed in psychotic conditions as well as in dementias are caused by this increased reliance on declarative-memory-based (and hence consciously controlled) explicit metalinguistic knowledge. As judiciously observed by psychiatrists familiar with bilingual patients, the second language requires more attention and conscious processing than the native language. This results in the differential behavioral symptoms mentioned earlier. In Alzheimer's dementia, where declarative memory is known to be more impaired, the second language is consequently the more vulnerable.

Evidence suggests the existence of two parallel frontal/basal-ganglia circuits, one projecting from the basal ganglia to BA 44, which sustains procedural-memory-related functions, and the other projecting to BA 45/47, which sustains declarative memory retrieval/selection (Ullman, 2006). This proximity may explain why language breakdown often affects both explicit and implicit elements.

To the extent that aspects of implicit competence are not available, in addition to using metalinguistic knowledge, speakers will also compensate by a greater reliance on pragmatics. This is where the right hemisphere does come into the picture—not to sustain implicit linguistic competence in L2, but, because more right-hemisphere-based pragmatic processing is necessary, especially for comprehension, whenever L2 grammar (implicit or explicit) is insufficient. Note that pragmatics is required for normal L1 comprehension as well, but to a lesser extent. Much pragmatic knowledge is conscious.

6.4. Dementias: parallels with bilingual aphasia

Although dementias are often described as a diffuse cognitive impairment affecting all processing, some processes seem to be particularly vulnerable, while others are particularly resistant (Funnel, 1987). In order to pinpoint the locus of the processing impairment, cognitive function in dementia is therefore best seen as specialized subsystems: In organic diseases, impairments may be confined to specific biological systems (Funnel, 1987), whether these systems are sustained by macro-anatomical areas or micro-anatomical networks or rely on the type and concentration of particular neurotransmitters. A modular

[5]Note that the difference between L1 and L2 is only quantitative. Even at the beginning of L2 learning, when implicit linguistic competence is non-existent, L2 learners do not use a mechanism that is not also used by native speakers. One of the two mechanisms, namely metalinguistic knowledge, may be used exclusively until some implicit competence develops, but at no point does a cerebral mechanism specific to speaking a second language emerge.

organization of specialized subsystems best accounts for both the aphasia and the dementia data.

The hypothesis that there is a separate lexicon for each language subsystem finds support in data from multilingual patients with semantic dementia. Mendez, Saghafi, and Clark (2004) describe two patients who were able to comprehend words in one language but not in the other languages they spoke fluently and daily. In one patient, word comprehension was moderately impaired in L1 and severely impaired in L2 (which he had previously taught) and L3. In the other patient, performance was worse in L2 than in L1, and his L3 was lost. The patients did not necessarily understand a word in one language that they comprehended in the other. They could differentially access word meaning in separate languages. The fact that the patients were able to name some objects in one of their languages shows that they recognized the objects, and that they therefore still had a conceptual representation of objects. The deficit lies in their inability to connect the conceptual representation with the appropriate lexical item in one or two of their languages. Patients with semantic dementia progressively lose the associations between names and their conceptual meanings in each language independently of the others. These data provide further support for the hypothesis of a distinct lexicon for each language subsystem, which is independently connected to the conceptual system (the three-store hypothesis, Paradis, 2004).

In the native language, (explicit) vocabulary is duplicated in the (implicit) lexicon. In later learned languages, vocabulary can only have a counterpart in the lexicon to the extent that it has been integrated within the implicit linguistic subsystem. In the absence of such integration, each word is represented only once, in declarative memory. It lacks the additional multiple connections available within the L1 implicit linguistic competence.

7. Conclusions

Various psychotic symptoms, including hallucinations, delusions, conceptual disorganization, hostility, anxiety, etc., have been reported to occur in either one or all of a patient's languages. These data are consistent with the subsystems hypothesis within the declarative/procedural framework. In a patient using two languages, either (1) implicit competence exists for only one language—in which case, two distinct systems are involved: one sustained by procedural memory (L1), the other, largely by declarative memory (L2); or (2) implicit memory exists for both languages (as micro-anatomically distinct subsystems of the neurofunctional language system) and both are sustained by procedural memory. In either case, one language can be selectively inhibited or deliberately selected. To the extent that there is some implicit linguistic competence in the second language, each subsystem will be subject to the usual inhibition/disinhibition process. To the extent that the L2 speaker must rely on explicit metalinguistic knowledge, the system that sustains it is neurofunctionally and macro-anatomically dissociated from the procedural system that sustains L1 competence.

Homologous to the grammatical impairments in the various types of bilingual aphasia recovery patterns, the process of transcoding thought into language[6] may be disturbed and result in schizophasia in the output of the language system; alternatively, the locus of dysfunction may be at the level of the interface of thought with one of the language

[6]Chomsky (2007, p. 246) refers to the interface between the language (I-language, e.g., English or Swahili) and the conceptual–intentional system.

subsystems, resulting in a language-specific disorder. As in bilingual aphasia, the disorder may be temporary or chronic, affect one language only, alternate between languages over time, or affect both languages for the entire duration of the psychosis. The thought–language interface may be more affected at the interface with one subsystem than with the other.

Given the description in the proposed theory of the way languages are represented and processed in the brain (Paradis, 2004), and conditional on the extent of automatization of each language, it is possible to account for all cases of psychotic and demented language impairments, with an explanation in terms of the particular etiology and consequent damage to specific cerebral mechanisms located in various areas, or to a specific neurobiological imbalance. The type of ailment (Alzheimer's, aphasia, schizophrenia) determines the type of symptomatology; the structure of each language (and the set of its associated cultural features) will determine the set of possible manifestations within the characteristic symptomatology (itself determined by the particular cerebral mechanism affected by each pathology).

Thought serves as input to the language system at encoding and results as the output of linguistic decoding. Thought disorder in schizophrenia may be exclusive to, or more obvious in, one of the languages when the impairment is at the language subsystem level of the thought–language interface. Some of the behavioral dissociations associated with the use of distinct languages may, however, be due, not to any different form of pathology, but to different cultural traits connected with each language.

In psychoses, the dual role of emotion (differential involvement of affect during the appropriation of each language and its lowering effect on the activation threshold of each one in every circumstance) will determine which language manifests more pathological symptoms. In addition, the orientation of the emotion will be modulated by the immediate social context (i.e., the perception of the host country relative to the home country, of the sociolinguistic status of each language, of the sources of threat, etc.).

In progressive dementias (Alzheimer's, Parkinson's and Huntington's diseases), the selective or greater impairment is caused by damage to either declarative memory, which affects later-learned languages to a greater extent (Alzheimer's), or procedural memory, which affects predominantly the native language(s) (Parkinson's, Huntington's). In schizophrenic psychoses, declarative memory is also important in late bilinguals, in that the use of declarative-based L2 is controlled, focused on form and thus distracted from content.

Several of the hypotheses integrated into a neurolinguistic theory of bilingualism (Paradis, 2004) have been shown to be relevant in the neuropsychiatric domain: (1) The activation threshold in the differential ability to understand and to produce language; (2) the selective impairment of L1, L2, or both, indicating subsystems rather than a single system or two independent systems; (3) the reversibility of symptoms, pointing to the inhibition and disinhibition of subsystems rather than their physical destruction; (4) the poorer the L2, the greater the reliance on declarative memory (metalinguistic knowledge and pragmatics), irrespective of the type of pathology; and (5) the role of affect in sustaining normal and pathological language.

References

Abutalebi, J., Miozzo, A., & Cappa, S. F. (2000). Do subcortical structures control 'language selection' in polyglots? Evidence from pathological language mixing. *Neurocase*, *6*, 51–56.

Ali, R. K. (2004). Bilingualism and systemic psychotherapy: Some formulations and explorations. *Journal of Family Therapy*, *26*, 340–357.

Altarriba, J., & Santiago-Rivera, A. L. (1994). Current perspectives on using linguistic and cultural factors in counseling the Hispanic client. *Professional Psychology: Research and Practice*, *25*, 388–397.

Amati-Mehler, J., Argentieri, S., & Canestri, J. (1993). *The Babel of the unconscious: Mother tongue and foreign languages in the psychoanalytic dimension*. Madison, CT: International Universities Press.

Appolonio, I., Grafman, J., Clark, K., Nichelly, P., Zeffirro, T., & Hallett, M. (1994). Implicit and explicit memory in patients with Parkinson's disease with and without dementia. *Archives of Neurology*, *51*, 359–367.

Arce, & Torres-Matrullo (1978). Psychiatric perspectives, acculturation: A prime factor in mental health of Hispanics. *Frontiers of Psychiatry*, *8*, 5–10.

Aron, A. R., Watkins, L., Sahakian, B. J., Monsell, S., Barker, R. A., & Robbins, T. W. (2003). Task-set switching deficits in early-stage Huntington's disease: Implications for basal ganglia function. *Journal of Cognitive Neuroscience*, *15*, 629–642.

Balint, M. (1979). *The basic fault: Therapeutic aspects of regression*. New York: Brunner Mazel.

Bamford, K. W. (1991). Bilingual issues in mental-health assessment and treatment. *Hispanic Journal of Behavioral Sciences*, *13*, 377–390.

Baxter, H., & Cheng, Y. C. (1996). Use of interpreters in individual psychotherapy. *Australian and New Zealand Journal of Psychiatry*, *30*, 153–156.

Bayles, K. A., Tomoeda, C. K., & Trosset, W. M. (1993). Alzheimer's disease: Effects on language. *Developmental Neuropsychology*, *9*, 131–160.

Bérubé, L. (1991). *Terminologie de neuropsychologie et de neurologie du comportement*. Montréal: Les Éditions de la Chenelière Inc.

Bhui, K. (1998). The public favours bilingual staff over interpreters. *British Medical Journal*, *317*, 816.

Bond, M. H., & Yang, K. (1982). Ethnic affirmation versus cross-cultural accommodation. The variable impact of questionnaire language on Chinese bilinguals from Hong Kong. *Journal of Cross-Cultural Psychology*, *13*, 169–185.

Bradford, D. T., & Muñoz, A. (1993). Translation in bilingual therapy. *Professional Psychology: Research and Practice*, *24*, 52–61.

Bruce, L. C. (1895). Notes of a case of dual brain action. *Brain*, *18*, 54–65.

Burke, J. L., Lafave, H. G., & Kurtz, G. E. (1965). Minority group membership as a factor in chronicity. *Psychiatry*, *28*, 234–238.

Butters, N., Wolfe, J., Martone, M., Granholm, E., & Cermack, L. S. (1985). Memory disorders associated with Huntington's disease: Verbal recall, verbal recognition and procedural memory. *Neuropsychologia*, *23*, 729–743.

Bylsma, F. W., Brandt, J., & Strauss, M. E. (1990). Aspects of procedural memory are differentially impaired in Huntington's disease. *Archives of Clinical Neuropsychology*, *5*, 287–297.

Carlson, R. (1979). The mother tongue in psychotherapy. *Canadian Journal of Psychiatry*, *24*, 542–545.

Cazzato, G., & Bava, A. (2003). Neuropsychological changes after subthalamic nucleus stimulation: A 12 month follow-up in nine patients with Parkinson's disease. *Parkinsonism and Related Disorders*, *10*, 73–79.

Cheng, L. Y., & Lo, H. T. (1991). On the advantages of cross-culture psychotherapy: The minority therapist/mainstream patient dyad. *Psychiatry*, *54*, 386–396.

Chomsky, N. (2007). Chatting with Chomsky. In H. Cohen, & B. Stemmer (Eds.), *Consciousness and cognition* (pp. 245–253). London: Academic Press.

Clauss, C. S. (1998). Language: The unspoken variable in psychotherapy practice. *Psychotherapy*, *35*, 188–196.

Cofresi, N. I., & Gorman, A. A. (2004). Testing and assessment issues with Spanish–English bilingual Latinos. *Journal of Counseling and Development*, *82*, 99–106.

Cohen, H. (2003). Disorders of speech and language in Parkinson's disease. In M. A. Bédard, Y. Agid, S. Chouinard, S. Fahn, A. D. Korczyn, & P. Lespérance (Eds.), *Mental and behavioral dysfunction in movement disorders*. Totowa, NJ: Humana Press.

Cuellar, I. (1982). The diagnosis and evaluation of schizophrenic disorders among Mexican Americans. In R. M. Becerra, M. Karno, & J. I. Escobar (Eds.), *Mental health and Hispanic Americans: Clinical perspectives* (pp. 61–81). New York: Grune & Stratton.

De Picciotto, D., & Friedland, D. (2001). Verbal fluency in elderly bilingual speakers: Normative data and preliminary application to Alzheimer's disease. *Folia Phoniatrica Logopaedica*, *53*, 145–152.

De Santi, S., Obler, L. K., Sabo-Abramson, H., & Goldberger, J. (1990). Discourse abilities and deficits in multilingual dementia. In Y. Joanette, & H. H. Brownell (Eds.), *Discourse ability and brain damage* (pp. 224–235). New York: Springer.

De Vita, C., Cooke, A., Lee, C., Detre, J., Alsop, D., Gee, J., et al. (2001). The neural basis for sentence comprehension difficulty in Parkinson's disease. *Brain and Language*, *79*, 11–12.

De Vreese, L. P., Motta, M., & Toschi, A. (1988). Compulsive and paradoxical translation behaviour in a case of presenile dementia of the Alzheimer type. *Journal of Neurolinguistics*, *3*, 233–259.

De Zulueta, F. I. S. (1984). The implication of bilingualism in the study and treatment of psychiatric disorders: A review. *Psychological Medicine*, *14*, 541–557.

De Zulueta, F. I. S. (1990). Bilingualism and family therapy. *Journal of Family Therapy*, *12*, 255–265.

De Zulueta, F. I. S. (1995). Bilingualism, culture and identity. *Group Analysis*, *28*, 179–190.

De Zulueta, F. I. S., Gene-Cos, N., & Grachev, S. (2001). Differential psychotic symptomatology in polyglot patients: Case reports and their implications. *British Journal of Medical Psychology*, *74*, 277–292.

Del Castillo, J. C. (1970). The influence of language upon symptomatology in foreign-born patients. *American Journal of Psychiatry*, *127*, 242–244.

Dores, M., M'Bodj, M., M'Bodj, B., & N'Dao, S. (1972). Bilinguisme et psychopathologie. *Psychopathologie Africaine*, *8*, 425–441.

Edgerton, R. B., & Karno, D. T. (1971). Mexican–American bilingualism and the perception of mental illness. *Archives of General Psychiatry*, *24*, 286–290.

Ervin, S. M. (1964). Language and T. A. T. content in bilinguals. *Journal of Abnormal and Social Psychology*, *68*, 500–507.

Findling, J. (1969). Bilingual need affiliation and future orientation in extragroup and intragroup domains. *Modern Languages Journal*, *53*, 227–231.

Fitzpatrick, J. P., & Gould, R. E. (1970). Mental illness among Puerto Ricans in New York: Cultural condition or intercultural misunderstanding? *American Journal of Orthopsychiatry*, *40*, 238–239.

Flaherty, J. A., Gaviria, F. M., Pathak, D., Mitchell, T., Wintrob, R., Richman, J. A., et al. (1988). Developing instruments for cross-cultural psychiatric research. *Journal of Nervous and Mental Disease*, *176*, 257–263.

Flaskerud, J. H., & Liu, P. Y. (1990). Influence of therapist ethnicity and language on therapy outcomes of Southeast Asian clients. *International Journal of Social Psychiatry*, *36*, 18–29.

Flaskerud, J. H., & Liu, P. Y. (1991). Effects of an Asian client–therapist language, ethnicity, and gender match on utilization and outcome of therapy. *Community Mental Health Journal*, *27*, 31–41.

Freeman, W., & Williams, J. M. (1953). Hallucinations in Braille. *Archives of Neurology and Psychiatry*, *70*, 630–634.

Friedland, D., & Miller, N. (1999). Language mixing in bilingual speakers with Alzheimer's dementia: A conversation analysis approach. *Aphasiology*, *13*, 427–444.

Funnel, E. (1987). Modeling cognitive function in dementia. In S. M. Stahl, S. D. Iversen, & E. C. Goodman (Eds.), *Cognitive neurochemistry* (pp. 37–45). Oxford: Oxford University Press.

Goldstein, K. (1948). *Language and language disturbances*. New York: Grune & Stratton pp. 138–146.

Gómez, E., Ruiz, P., & Laval, R. (1982). Psychotherapy and bilingualism: Is acculturation important? *Journal of Operational Psychiatry*, *13*, 13–16.

Grand, S., Marcos, L. R., Freedman, N., & Narroso, F. (1977). Relation of psychopathology and bilingualism to kinesic aspects of interview behavior in schizophrenia. *Journal of Abnormal Psychology*, *86*, 492–500.

Guarnaccia, P. J., & Rodriguez, O. (1996). Concepts of culture and their role in the development of culturally competent mental health services. *Hispanic Journal of Behavioral Sciences*, *18*, 419–443.

Guttfreund, D. G. (1990). Effects of language usage on the emotional experience of Spanish–English and English–Spanish bilinguals. *Journal of Consulting and Clinical Psychology*, *58*, 604–607.

Harris, C., Aiçiçegi, A., & Gleason, J. (2003). Taboo words and reprimands elicit greater autonomic reactivity in a first language than in a second language. *Applied Psycholinguistics*, *24*, 561–579.

Hebb, D. O. (1949). *The organization of behavior*. New York: John Wiley.

Heinemann, F., & Assion, H. G. (1996). Linguistic regression to use of the native language only in bilingual persons during acute psychotic episodes. *Nervenarzt*, *67*, 599–601.

Hemphill, R. E. (1971). Auditory hallucinations in polyglots. *South African Medical Journal*, *45*, 1391–1394.

Hemphill, R. E. (1976). Polyglot aphasia and polyglot hallucinations. In S. Krauss (Ed.), *Encyclopaedic handbook of medical psychology* (pp. 398–400). London: Butterworth & Co.

Herbert, R. K. (1984). Sociolinguistics and psychopathology: The auditory hallucinations of bilinguals. *Journal of Multilingual and Multicultural Development*, *5*, 113–130.

Hilton, A., & Strutkowski, M. (2002). Translating instruments into other languages: Development and testing processes. *Cancer Nursing*, *25*, 1–7.

Hong, Y. Y., Chiu, C. Y., & Kung, T. M. (1997). Bringing culture out in front: Effects of cultural meaning system activation on social cognition. In K. Leung, Y. Kashima, U. Kim, & S. Yamaguchi (Eds.), *Progress in Asian psychology*, Vol. 1 (pp. 135–146). Singapore: Wiley.

Hong, Y. Y., Morris, M., Chiu, C. Y., & Benet-Martínez, V. (2000). A dynamic constructivist approach to culture and cognition. *American Psychologist*, *55*, 709–720.

Hsia, Y. F., & Tsai, N. (1981). Transcultural investigation of recent symptomatology of schizophrenia in China. *American Journal of Psychiatry*, *138*, 1484–1486.

Hughes, G. W. (1981). Neuropsychiatric aspects of bilingualism: A brief review. *British Journal of Psychiatry*, *139*, 25–28.

Hyltenstam, K., & Stroud, C. (1989). Bilingualism in Alzheimer's dementia: Two case studies. In K. Hyltenstam, & L. K. Obler (Eds.), *Bilingualism across the lifespan: Aspects of acquisition, maturity and loss* (pp. 202–226). Cambridge: Cambridge University Press.

Hyltenstam, K., & Stroud, C. (1993). Second language regression in Alzheimer's dementia. In K. Hyltenstam, & Å. Viberg (Eds.), *Progression and regression in language* (pp. 222–242). Cambridge: Cambridge University Press.

Javier, R. A. (1989). Linguistic considerations in the treatment of bilinguals. *Psychoanalytic Psychology*, *6*, 517–526.

Javier, R. A. (2007). *The bilingual mind: Thinking, feeling and speaking in two languages*. New York: Springer.

Javier, R. A., Barroso, F., & Muñoz, M. A. (1993). Autobiographical memory in bilinguals. *Journal of Psycholinguistic Research*, *22*, 319–338.

Jerrell, J. (1995). The effects of client–therapist match on service: Use and costs. *Administration and Policy in Mental Health*, *23*, 119–126.

Jones, D., & Gill, P. (1998). Breaking down language barriers. *British Journal of Medicine*, *316*, 1476–1480.

Kalinowsky, L. (1975). Clinical observations in ECT. *American Journal of Psychiatry*, *132*, 878.

Kalinowsky, L. (1982). Trilingualism. *British Journal of Psychiatry*, *140*, 435.

Katsavdakis, K. A., Sayed, M., Bram, A., & Brand Bartlett, A. (2001). How was this story told in the mother tongue? An integrative perspective. *Bulletin of The Menninger Clinic*, *65*, 246–265.

Kempler, D. (1995). Language changes in dementia of the Alzheimer's type. In R. Lubinski (Ed.), *Dementia and communication* (pp. 88–114). San Diego, CA: Singular Publishers.

Kline, L. Y. (1969). Some factors in the psychiatric treatment of Spanish Americans. *American Journal of Psychiatry*, *125*, 1674–1681.

Kluckhohn, C. (1964). *Culture and behavior*. New York: Free Press.

Kolers, P. A. (1963). Interlingual word associations. *Journal of Verbal learning and Verbal Behavior*, *2*, 291–300.

Lamendella, J. (1977). General principles of neurofunctional organization and their manifestation in primary and secondary language acquisition. *Language Learning*, *27*, 155–196.

Laski, E., & Taleporos, E. (1977). Anticholinergic psychosis in a bilingual: A case study. *American Journal of Psychiatry*, *134*, 1038–1040.

Lin, L. C., & Chang, C. C. (2003). A Chinese translation of the EdFED-Q and assessment of equivalence. *Alzheimer Disease and Associated Disorders*, *17*, 230–235.

Lipsius, L. (1975). Electroconvulsive therapy and language. *American Journal of Psychiatry*, *132*, 459.

Lukianowicz, N. (1962). Auditory hallucinations in polyglot subjects. *Psychiatria et Neurologia*, *143*, 274–294.

Malgady, R. G., & Costantino, G. (1998). Symptom severity in bilingual Hispanics as a function of clinician ethnicity and language of interview. *Psychological Assessment*, *10*, 120–127.

Malgady, R. G., Rogler, L. H., & Costantino, G. (1987). Ethnocultural and linguistic bias in mental health evaluation of Hispanics. *American Psychologist*, *42*, 228–234.

Malo Ocejo, P., Medrano Albeniz, J., & Uriarte Uriarte, J. J. (1991). Alucinaciones auditivas en sujetos bilingües. *Archivos de Neurobiologia*, *54*, 15–19.

Marcos, L. R. (1976a). Bilinguals in psychotherapy: Language as an emotional barrier. *American Journal of Psychotherapy*, *30*, 553–560.

Marcos, L. R. (1976b). Linguistic dimensions in the bilingual patient. *The American Journal of Psychoanalysis*, *36*, 347–353.

Marcos, L. R. (1979). Effects of interpreters on the evaluation of psychopathology in non-English-speaking patients. *American Journal of Psychiatry*, *136*, 171–174.

Marcos, L. R., & Alpert, M. (1976). Strategies and risks in psychotherapy with bilingual patients: The phenomenon of language independence. *American Journal of Psychiatry*, *133*, 1275–1278.

Marcos, L. R., & Urcuyo, L. (1979). Dynamic psychotherapy with the bilingual patient. *American Journal of Psychotherapy*, *33*, 331–338.

Marcos, L. R., Alpert, M., Urcuyo, L., & Kesselman, M. (1973). The effect of interview language on the evaluation of psychopathology in Spanish-American schizophrenic patients. *American Journal of Psychiatry*, *130*, 549–553.

Marcos, L. R., Eisma, J., & Guimon, J. (1977). Bilingualism and sense of self. *The American Journal of Psychoanalysis*, *37*, 285–290.

Marcos, L. R., Urcuyo, L., Kesselman, M., & Alpert, M. (1973). The language barrier in evaluating Spanish-American patients. *Archives of General Psychiatry*, *29*, 655–659.

Mariën, P., Abutalebi, J., Engelborghs, S., & De Deyn, P. P. (2005). Pathophysiology of language switching and mixing in an bilingual child with subcortical aphasia. *Neurocase*, *11*, 385–398.

Marrero, M. Z., Golden, C. J., & Espe-Pfeifer, P. (2002). Bilingualism, brain injury, and recovery: Implications for understanding the bilingual and for therapy. *Clinical Psychology Review*, *22*, 463–478.

Marrero, R. (1983). Bilingualism and biculturalism: Issues in psychotherapy with Hispanics. *Psychotherapy in Private Practice*, *1*, 57–64.

Marshall, J., Atkinson, J., Woll, B., & Thacker, A. (2005). Aphasia in a bilingual user of British sign language and English: Effects of cross-linguistic cues. *Cognitive Neuropsychology*, *22*, 719–736.

Matulis, A. C. (1977). Schizophrenia: Experiment in teaching a new foreign language to inpatients as an analeptic ego aid. *Dynamische Psychiatrie*, *10*, 459–472.

Melvold, J. L., Au, R., Obler, L. K., & Albert, M. L. (1984). Language during aging and dementia. In M. L. Albert, & J. E. Knoefel (Eds.), *Clinical neurology of aging* (pp. 329–346). Oxford: Oxford University Press.

Mendez, M. F., Perryman, K. M., Pontón, M. O., & Cummings, J. L. (1999). Bilingualism and dementia. *Journal of Neuropsychiatry and Clinical Neurosciences*, *11*, 411–412.

Mendez, M. F., Saghafi, S., & Clark, D. G. (2004). Semantic dementia in multilingual patients. *Journal of Neuropsychiatry and Clinical Neurosciences*, *16*, 381.

Minkowski, M. (1928). Sur un cas d'aphasie chez un polyglotte. *Revue Neurologique*, *49*, 361–366.

Moretti, R., Torre, P., Antonello, R. M., Capus, L., Gioulis, M., Marsala, S., et al. (2001). Effects on cognitive abilities following subthalamic nucleus stimulation in Parkinson's disease. *European Journal of Neurology*, *8*, 726–727.

Moretti, R., Torre, P., Antonello, R. M., Capus, L., Gioulis, M., Marsala, S. Z., et al. (2002). Cognitive changes following subthalamic nucleus stimulation in two patients with Parkinson disease. *Perceptual and Motor Skills*, *95*, 477–486.

Murray, L. L. (2000). Spoken language production in Huntington and Parkinson's diseases. *Journal of Speech, Language, and Hearing Research*, *43*, 1350–1366.

Nilipour, R., & Ashayeri, H. (1989). Alternating antagonism between two languages with successive recovery of a third in a trilingual aphasic patient. *Brain and Language*, *36*, 23–48.

Nishimura, M. (1986). Intrasentential code-switching: The case of language assignment. In J. Vaid (Ed.), *Language processing in bilinguals* (pp. 123–143). Hillsdale, NJ: Lawrence Erlbaum Associates.

Obler, L. K., De Santi, S., & Goldberger, J. (1995). Bilingual dementia: Pragmatic breakdown. In R. Lubinski (Ed.), *Dementia and communication* (pp. 133–139). San Diego, CA: Singular.

Oquendo, M. A. (1996a). Psychiatric evaluation and psychotherapy in the patient's second language. *Psychiatric Services*, *47*, 614–618.

Oquendo, M. A. (1996b). In reply [to Toppelberg, 1996]. *Psychiatric Services*, *47*, 1002.

Paradis, M. (1977). Bilingualism and aphasia. In H. Whitaker, & H. A. Whitaker (Eds.), *Studies in Neurolinguistics*, Vol. 3 (pp. 65–121). New York: Academic Press.

Paradis, M. (1990). Language lateralization in bilinguals: Enough already!. *Brain and Language*, *39*, 576–588.

Paradis, M. (1994). Neurolinguistic aspects of implicit and explicit memory: Implications for bilingualism. In N. Ellis (Ed.), *Implicit and explicit learning of second languages* (pp. 393–419). London: Academic Press.

Paradis, M. (1997). Représentation lexicale et conceptuelle chez les bilingues: Deux langues, trois systèmes. In J. Auger, & Y. Rose (Eds.), *Explorations du lexique* (pp. 15–27). Québec: CIRAL.

Paradis, M. (2003). The Bilingual Loch Ness Monster raises its nonasymmetric head again: Or, why bother with such cumbersome notions as validity and reliability? *Brain and Language*, *87*, 441–448 (Comments on Evans et al. (2002)).

Paradis, M. (2004). *A neurolinguistic theory of bilingualism*. Amsterdam: John Benjamins.

Paradis, M. (2007). The neurofunctional components of the bilingual cognitive system. In I. Keczkes (Ed.), *Cognitive aspects of bilingualism* (pp. 3–28). New York: Springer.

Paradis, M., & Goldblum, M.-C. (1989). Selective crossed aphasia in one of a trilingual's languages followed by antagonistic recovery. *Brain and Language*, *36*, 62–75.

Paradis, M., Goldblum, M.-C., & Abidi, R. (1982). Alternat[ing] antagonism with paradoxical translation behavior in two bilingual aphasic patients. *Brain and Language*, *15*, 55–69.

Paradis, M., & Libben, G. (1987). *The assessment of bilingual aphasia*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Pavlenko, A. (2006). *Emotions and multilingualism*. Cambridge: Cambridge University Press.

Pavlenko, A. (2008). Emotion and emotion-laden words in the bilingual lexicon. *Bilingualism: Language and Cognition* in press.

Peck, E. (1973). The relationship of disease and other stress on second language. *International Journal of Social Psychiatry*, *20*, 128–133.

Perecman, E. (1984). Spontaneous translation and language mixing in a polyglot aphasic. *Brain and Language*, *23*, 43–53.

Pérez Foster, R. M. (1996). The bilingual self: Duet in two voices. *Psychoanalytic Dialogues*, *6*, 99–121.

Pérez Foster, R. M. (2001). When immigration is trauma: Guidelines for the individual and family clinician. *American Journal of Orthopsychiatry*, *71*, 153–170.

Phelan, M., & Parkman, S. (1995). How to work with an interpreter. *British Medical Journal*, *311*, 555–557.

Pitres, A. (1895). Etude sur l'aphasie chez les polyglottes. *Revue de médecine*, *15*, 873–899.

Pitta, P., Marcos, L. C., & Alpert, M. (1978). Language switching as a treatment strategy with bilingual patients. *The American Journal of Psychoanalysis*, *38*, 255–258.

Poplack, S. (1980). Sometimes I'll start a sentence in English y termino en español. *Linguistics*, *18*, 581–618.

Rainer, J. D., Abdullah, S., & Altshuler, K. Z. (1970). Phenomenology of hallucinations in the deaf. In W. Keup (Ed.), *Origin and mechanisms of hallucinations* (pp. 449–456). New York: Plenum Press.

Ramírez-Esparza, N., Gosling, S. D., Benet-Martínez, V., Potter, J. P., & Pennebaker, J. W. (2006). Do bilinguals have two personalities? A special case of cultural frame switching. *Journal of Research in Personality*, *40*, 99–120.

Revitch, E. (1975). Aphasia in polyglots (letter). *American Journal of Psychiatry*, *132*, 1221.

Ribot, T. (1881). *Les maladies de la mémoire*. Paris: G. Baillère.

Rieber, R. W., & Vetter, H. J. (1995). *The psychopathology of language and cognition*. New York: Plenum Press (Chapter 8: Psychopathology and the polyglot, pp. 151–178).

Robles Garcia, R., Garibay Rico, S. E., & Páez Agráz, F. P. (2006). Dissociative disorders in Mexican psychiatric patients: Prevalence, comorbidity and 38 dissociative experiences scale psychometric properties. *Salud Mental*, *29*, 38–43.

Rosenbaum, J., & Gelenberg, A. (1975). Clinical observations in ECT (letter). *American Journal of Psychiatry*, *132*, 878.

Rozensky, R. H., & Gomez, M. Y. (1983). Language switching in psychotherapy and bilinguals: Two problems and case examples. *Psychotherapy: Theory, Research and Practice*, *20*, 152–160.

Ruiz, P. (1982). The Hispanic patient: Sociocultural perspectives. In R. M. Becerra, M. Karno, & J. I. Escobar (Eds.), *Mental health and Hispanic Americans: Clinical perspectives* (pp. 17–27). New York: Grune & Stratton.

Sacks, O. (1990). *Awakenings*. New York: Harper and Collins Publishers.

Saint-Cyr, J. A., Taylor, A. E., & Lang, A. E. (1988). Procedural learning and neostriatal function in man. *Brain*, *111*, 941–959.

Santiago-Rivera, A. L., & Altarriba, J. (2002). The role of language in therapy with the Spanish–English bilingual client. *Professional Psychology Research and Practice*, *33*, 30–38.

Schmand, B., Kop, W. J., Kuipers, T., & Bosveld, J. (1992). Implicit learning in psychotic patients. *Schizophrenia Research*, *7*, 555–564.

Schmidt, K. E. (1965). Communication problems with psychiatric patients in the multilingual society of Sarawak. *Psychiatry*, *28*, 229–233.

Schrauf, R. (2001). Bilingualism, memory and dementia. *Neurology and Alzheimer's Disease Center News*, *15*, 1–3.

Schrauf, R. W. (2000). Bilingual autobiographical memory: Experimental studies and clinical cases. *Culture & Psychology*, *6*, 387–417.

Segovia Price, C. S., & Cuellar, I. (1981). The effects of language and related variables on the expression of psychopathology in Mexican American psychiatric patients. *Hispanic Journal of Behavioral Sciences*, *3*, 145–160.

Smart, J. F., & Smart, D. W. (1995). The use of translators/interpreters in rehabilitation. *Journal of Rehabilitation*, *61*, 14–20.

Snowden, L., Hu, T., & Jerrell, M. (1995). Emergency case avoidance: Ethnic matching and participation in minority-serving programs. *Community Mental Health Journal*, *31*, 463–473.

Snowden, L., Masland, M., Ma, Y. F., & Ciemens, E. (2006). Strategies to improve minority access to public mental health services in California: Description and preliminary evaluation. *Journal of Community Psychology*, *34*, 225–235.

Teichmann, M., Dupoux, E., Kouider, S., Brugières, P., Boissé, M. F., Baudic, S., et al. (2005). The role of the striatum in rule application: The model of Huntington's disease at early stage. *Brain*, *128*, 1155–1167.

Toppelberg, C. O. (1996). Psychiatric evolution in a second language. *Psychiatric Services*, *47*, 1001–1002.

Toppelberg, C. O., Medrano, L., Morgens, L. N., & Nieto-Castañon, A. (2002). Bilingual children referred for psychiatric services: Associations of language disorders, language skills, and psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry*, *41*, 712–722.

Toppelberg, C. O., Nieto-Castañon, A., & Hauser, S. I. (2006). Bilingual children: Cross-sectional relations of psychiatric syndrome severity and dual language proficiency. *Harvard Review of Psychiatry*, *14*, 15–29.

Torrey, E. F. (1986). *The mind game: Witchdoctors and psychiatrists*. New York: Harper & Row.

Ullman, M. T. (2001). The neural basis of lexicon and grammar in first and second language: The declarative/procedural model. *Bilingualism: Language and Cognition*, *4*, 105–122.

Ullman, M. T. (2006). Is Broca's area part of a basal ganglia thalamocortical circuit? *Cortex*, *42*, 480–485.

Ullman, M. T., Corkin, S., Coppola, M., Hickok, G., Growdon, J. H., Koroshetz, W. J., et al. (1997). A neural dissociation between language: Evidence that the mental dictionary is part of declarative memory, and that grammatical rules are processed by the procedural system. *Journal of Cognitive Neuroscience*, *9*, 266–276.

Varricchio, C. G. (1997). Measurement issues concerning linguistic translations. In M. Frank-Stromborg, & S. J. Olsen (Eds.), *Instruments for clinical health-care research* (pp. 54–63). Boston: Jones and Bartlett.

Vasquez, C., & Javier, R. A. (1991). The problem with interpreters: Communicating with Spanish-speaking patients. *Hospital Community Psychiatry*, *42*, 163–165.

Wang, J. H., Morales, O., & Hsu, L. K. (1998). Auditory hallucinations in bilingual immigrants. *Journal of Nervous and Mental Disorders*, *186*, 501–503.

Westermeyer, J. J. (1990). Working with an interpreter in psychiatric assessment and treatment. *Journal of Nervous and Mental Diseases*, *178*, 745–749.

Yazawa, S., Kawasaki, S., & Ohi, T. (2003). Is there less micrographia in foreign language in Parkinson's disease? *Neurology*, *61*, 1817.

Zanini, S., Melatini, A., Capus, L., Gioulis, M., Vassallo, A., & Bava, A. (2003). Language recovery following subthalamic nucleus stimulation in Parkinson's disease. *NeuroReport*, *14*, 511–516.

Zanini, S., Tavano, A., Vorano, L., Schiavo, F., Gigli, G. L., Aglioti, S. M., et al. (2004). Greater syntactic impairments in native language in bilingual Parkinsonian patients. *Journal of Neurology, Neurosurgery and Psychiatry*, *75*, 1678–1681.

Ziguras, S., Klimidis, S., Lewis, J., & Stuart, G. (2003). Ethnic matching of clients and clinicians and use of mental health services by ethnic minority clients. *Psychiatric Services*, *54*, 535–541.

Zislin, J., Kuperman, V., & Durst, R. (2002). The generation of psychosis: A pragmatic approach. *Medical Hypotheses*, *58*, 9–10.