

Bilingualism and schizophrenia

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Abstract

Although a bilingual advantage has been described for neurodegenerative disease in general, it is not known whether such an advantage could accrue to individuals suffering from schizophrenia, since language networks are known to be disrupted in this condition. The aim of this minireview was to scan the existing literature to determine: (1) whether individuals with schizophrenia are able to learn a second language as adults; (2) whether clinical assessment, both for the purpose of accurate diagnosis and for the prediction of treatment response, should be carried out in both languages in

bilinguals with schizophrenia; (3) whether psychotherapy in schizophrenia is affected by bilingualism; and (4) whether speaking a second language improves outcome in schizophrenia. The literature to date is too sparse to make definitive statements, but: (1) individuals with schizophrenia appear to be capable of learning a new language as adults; and (2) it is possible that teaching a foreign language may serve as a form of cognitive rehabilitation for this condition. This literature review recommends research into the effects of bilingualism on the outcome of schizophrenia. Included in this review is a retrospective pilot study conducted in Canada, which suggests that employment opportunities for patients with schizophrenia are improved when they speak more than one language. This is important to note because employment is generally problematic in the context of schizophrenia while, at the same time, the ability to obtain work contributes significantly to quality of life.

Key words: Schizophrenia; Bilingualism; Language; Employment; Cognitive rehabilitation; Outcome

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Core tip: Even though language deficits are a core problem in schizophrenia, learning a second language may be of cognitive and social benefit. Bilingualism may contribute to cognitive reserve and may be especially valuable in increasing employment opportunities for patients with schizophrenia.

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INTRODUCTION

Language and schizophrenia

Language idiosyncracies have long been observed

in patients with schizophrenia^[1-4]. The deficiencies in language that have been linked to schizophrenia include problems in speaking (flat intonation, unusual voice quality, unintelligible utterances^[5]), listening (inattention, distraction, failure of understanding), reading (stilted prosody, word approximation, misunderstanding of idiom and metaphor^[6]), writing (erratic handwriting, unusual use of size and space^[7]), grammar^[8] (chaotic sentence structure and syntax, unusual order and sequence), and vocabulary (limited vocabulary, neologisms, clanging or glossomania). Alogia, or very little conversation, often accompanies schizophrenia, and, of all language disturbances, is the one most predictive of a poor quality of life^[9]. Disorganization of language is almost pathognomonic of schizophrenia, is especially pronounced under conditions of stress^[10], and is more pronounced in men than in women^[11]. Interestingly, there is a relative absence of disorganized language in late onset schizophrenia, a condition more prevalent in women^[12].

Speech in adolescent and young adult onset of schizophrenia is characterized by a loosening of associations, which takes the form of derailment, a slipping into oblique or unrelated topics, or of tangentiality, where responses to a question seem to be unrelated to the question posed. Metaphors and proverbs are characteristically difficult for individuals with schizophrenia to grasp the meaning of^[13-15]. Words are used in an idiosyncratic way, suggesting a private meaning. The language of persons with schizophrenia has been referred to as a "word salad" because of the difficulty in understanding the message it conveys^[16]. As linguist Chaika^[17] has written, conversation in individuals with schizophrenia seems to be more influenced by the form and sound of words spoken or heard in the immediate past than by the needs of communication. The speech identifiers required to make meaning comprehensible to the listener are often missing or ambiguous^[18]. Much depends on whether patients are studied when medicated or non-medicated. Medicated patients are usually more verbally communicative and show an increase in the complexity and coherence of their speech, with a decrease in pathological utterances^[19-21]. This is interesting because antipsychotic drugs are antidopaminergic and research suggests that dopamine plays a role in the activation of semantic networks^[22,23].

Language problems in schizophrenia have been attributed to a deficit in hemispheric lateralization^[24] and to impaired executive functions such as attention and sequencing^[25].

Bilingual advantage in neurodegenerative disease

While language skills form an undisputed part of the cognitive deficit seen in schizophrenia, little has been written about how bilingualism affects the course of schizophrenia. This is despite the fact that recent literature has shown potential advantages of bilingualism in other brain diseases, mainly dementia.

Bilingualism is associated with an up to five-year delay in the onset of Alzheimer's disease^[26-28]. Bilingual patients diagnosed with probable Alzheimer's disease have been shown to exhibit substantially more atrophy in temporal regions than do their monolingual counterparts while still functioning at the same cognitive level^[29]. fMRI studies have demonstrated greater efficiency in brain activation for bilinguals relative to monolinguals^[30,31], sometimes, but not always, correlated with behaviour.

The mechanisms by which bilingualism can slow the progress of neurodegenerative disease remain speculative^[32,33]. An influential model for understanding what happens in the bilingual brain is the adaptive cognitive hypothesis^[34], which argues that the demands of choosing between two languages in vocabulary and in syntax mold neural networks in such a way as to benefit cognition. Particularly relevant to schizophrenia is the finding that bilingualism in the general population benefits convergent thinking while inhibiting divergent thinking^[35].

Unfortunately, there is more than one definition of bilingualism^[36], which probably explains the inconsistencies in the literature as to the benefit acquired through knowing more than one language^[37]. It has also been suggested that there may be a bias towards reporting cognitive advantage in bilingualism studies and ignoring studies that show null or negative results^[38].

AIM

In the hope of discovering whether bilingualism delays or ameliorates symptoms of schizophrenia, or improves the quality of life in schizophrenia, I did a literature search on bilingualism in psychosis.

RESEARCH

I searched the terms "foreign language", "second language", and "bilingualism" in conjunction with the terms "schizophrenia" and "psychosis" in the multidisciplinary Google Scholar database. Forty-four articles were found from the years 1955 to 2015, some theoretical, some clinical/observational, some experimental.

FINDINGS

People with schizophrenia can learn a second language

Given the cognitive deficits and negative symptoms that accompany schizophrenia, it was first necessary to find out whether people with schizophrenia were capable of learning a second language as adults. Once childhood is past, learning a second language has been considered a relatively difficult task for everyone, but it is now acknowledged that new languages can be learned at any time in life, and that adult learners have several learning advantages over children: They can rely on previously acquired language skills, their

brains are more mature, and they have more years of practice in learning how to learn. Adult learners have the disadvantage, however, of lacking the same opportunities that children have of learning a new language. They are not in school and are not always surrounded by peers speaking the new language. On the other hand, they are often more motivated to learn than they were as children^[39]. Experts believe that, except for native-level pronunciation, which is difficult to attain after age ten or thereabouts, learning a new language is actually easier for adults than for children^[40].

Individuals with schizophrenia are challenged by cognitive deficits, but the belief that learning a second language will exacerbate such difficulties is probably a myth^[40]. Bersudsky *et al*^[41] studied 16 Russian immigrants to Israel, eight of whom had a diagnosis of schizophrenia. They found that the two groups learned Hebrew in very much the same way and at the same speed. The investigators concluded that, despite the cognitive compromises in schizophrenia and the manifest atypicalities in the language of speakers with schizophrenia, the process of acquiring a second language was relatively unaffected by the illness^[41].

Smirnova *et al*^[42] studied Russian adults who had recently immigrated to Israel, ten of whom suffered from schizophrenia. All eight men and two women, though from varied educational backgrounds, were well able to learn Hebrew and all of them had become functionally bilingual by the time the research was conducted. Because there are so many variables influencing the speed of learning a second language (age, education, motivation, effort, exposure, and reward among others), showing that individuals with schizophrenia learn at the same speed as control subjects may require much larger samples than have heretofore been studied.

Potential benefits of bilingualism for people with schizophrenia

The cognitive benefits of bilingualism extend beyond individuals with dementia. Learning a second language has been shown to produce rapid dynamic changes in white matter tracts in all adults, changes that correspond with improved cognitive functioning^[43]. This finding presents a strong argument for the general benefits of language learning for everyone. Although many types of environmental input, cognitive demand, or learning experience can result in experience-dependent neural changes, the intensity and frequency of language use appears to exert particular power in bringing about beneficial brain changes, even when languages are learned relatively late in life^[44].

A second rationale for learning a second language for individuals with schizophrenia is the strong association between language skills and social functioning. Studying the language of 108 individuals in an Early Intervention Program for psychosis in Ireland, researchers found that the disorganization dimension on a formal thought

disorder scale was significantly associated with clinician-rated measures of occupational and social functioning; the higher the score on the thought disorder scale, the lower the score on functioning^[45]. In addition, their measure of bizarre idiosyncratic thinking was significantly associated with a performance-based measure of functioning^[45] even though, when it came to real-world measures of functioning, language disturbance was not a good predictor in this study.

Transfer of skills to real life is always problematic. Nevertheless, learning a second language can be conceptualized as a form of cognitive therapy that promises to build cognitive reserve^[46]. Because cognitive reserve refers to brain plasticity, it is not an easy concept to measure, but increases in reserve may be ascertained by demonstrating changes in tests of memory/language, processing speed/executive function, and attention.

Bilingualism and assessment in schizophrenia

There is a growing literature on other aspects of bilingualism in schizophrenia, especially studies of polyglot patients with different degrees of psychotic symptoms depending on the language they use^[47].

On the basis of study results, Theron^[48] recommends assessment in all languages spoken by bilingual schizophrenia patients if possible, in order to determine the full range of symptoms, to gain a better indication of the severity of illness, and to be better able to track the progress of recovery.

Southwood *et al*^[49] make the same recommendation based on oral interviews conducted with a single male patient who displayed more language disturbances in his second language than in his native language. Armon-Lotem *et al*^[50] also describe schizophrenia patients who display more problems in their second language than in their first. Smirnova *et al*^[42], in their study of 10 Russian Hebrew bilinguals with a diagnosis of schizophrenia, also found that some syntax and semantic impairments were more pronounced in the later-learned language.

Language idiosyncrasies in a recently learned language, however, although they may be more pronounced than in one's native language, are easily overlooked by an assessor because they are automatically attributed to imperfect language learning rather than to thought disorder^[51].

It has been reported that auditory hallucinations tend to occur only in one's mother tongue^[52,53], but that probably depends on the identity of the hallucinatory speaker and the content of the message^[54]. To prove that diagnostic or prognostic assessment is more accurate in one language than another, the two strategies would need to be compared, which has not yet been done.

Bilingualism, schizophrenia and therapy

Psychotherapy is not considered curative in schizophrenia, but it is generally acknowledged to be an essential part of comprehensive treatment. The question often addressed in the psychotherapy literature is

whether effectiveness in bilinguals depends on the language in which therapy is delivered.

One's mother tongue is characterized in the psychoanalytic literature as the language of repressed memories or the language of the unconscious. One's second language serves more defensive purposes and is seen as the language of rationality. Given equal proficiency, the consensus is that an individual in therapy uses the language least likely to provoke anxiety, which usually means avoiding the native language whenever possible^[55] because later learned languages allow more detachment when forced to speak about emotionally charged material^[56].

It is reportedly typical for bilingual patients to switch back and forth between primary and secondary languages in psychotherapy, perhaps to manage anxiety or perhaps because there are some issues that can only be expressed in a specific language^[57]. Some reports mention a tendency for patients in therapy to return to their mother tongue when expressing strong affects, when describing dreams, or when dealing with death or severe trauma. Memories are said to be more detailed and more emotionally-laden when told in the language in which the remembered events were originally encoded^[58,59].

Bilingual patients can often express different values or even assume different identities in different languages, which can change the interpersonal relationship of patient and therapist^[60-64]. Specifically for individuals with psychotic disorders, it has been suggested that avoiding the native tongue may be a defensive attempt to reduce primary process thinking and increase the strength of the healthy observing ego^[65]. Such suggestions are interesting, but speculative. No empirical studies have been done.

Does a second language improve outcome in schizophrenia?

In the non-ill population, bilingualism has been shown to be associated with increased self-esteem^[66], with improved communication skills, self-image, creative abilities, educational achievement, and employment opportunities^[67].

Although there is no evidence of improved outcome with respect to symptoms in bilingual individuals with schizophrenia, there is a suggestion that outcome in first and second generation immigrants two years after a first episode of psychosis is superior to that of native born citizens^[68]. This is the case despite the fact that immigration is a risk factor for the emergence of psychosis, and also for poor engagement in treatment^[69].

In 1977, Matulis^[70] gave weekly German lessons to 18 male patients in a schizophrenia ward in a Michigan hospital for almost a year, documenting language progress as well as changes in symptoms. Whenever behavioral problem emerged, instead of the culprit being removed from the language class, he was actively engaged in using the newly learned German language.

The clinical (admittedly subjective) observation was that the patients' symptoms decreased and overall well-being improved.

Quite apart from the question of the potential cognitive benefits of speaking a second language as these pertain to schizophrenia, there appear to be social advantages of second language training in psychosis.

When an individual with schizophrenia coins neologisms and speaks in "word salad" in his or her native language, communication breaks down and this results in social isolation for the speaker and an increase in stigmatizing attitudes on the part of listeners. Listeners do not react in this way when hearing disorganized language from a non-native speaker because, here, the conversational expectations are different. The use of neologisms under these circumstances is interpreted not as "madness" but as a way of new language learners to refer to objects for which they have not yet learned the correct term^[51].

It has been suggested that the person with schizophrenia may even have an advantage when it comes to learning a new language. The lateral thinking ability of psychosis-prone individuals allows them to think creatively about words and automatically elaborate alternative expressions when their vocabulary is constrained^[51]. In addition, the practice of listening for hallucinatory voices may sharpen one's skill for listening to interior monologue, which is a prerequisite for new language learning^[51]. Such suggestions are provocative, but have not been empirically tested.

One important measure of outcome in an illness such as schizophrenia is employment. A recent study from Israel shows that, as of December 2010, only 10.6% of patients with schizophrenia with one prior hospital admission earned a minimum wage or higher. For those with multiple admissions, the percentage was 5.8%^[71].

Because bilingualism is considered to be an advantage on the job market^[72], and because employment rates are so low in schizophrenia^[73], I compared unilingual vs bilingual patients in our Toronto clinic with respect to employment success.

I looked at employment outside the home of 83 consecutively admitted individuals with DSM-IV schizophrenia (33 men and 50 women) allocated to unilingual English ($n = 53$) and bilingual ($n = 30$) groups. Ages ranged from 25-55. The bilinguals were all educated in English from an early age, but had spoken another language in the parental home. In 4 out of the thirty bilingual cases, the second language was French. Six of 30 bilingual patients (all women, three French speakers) were working full or part-time. All three French speakers were teachers, two others in the group were salespersons and one was a helping professional. In the English-only group, only two of 53 patients (both women) were working, both as office assistants. The difference in employment between the monolingual and bilingual group is significant at a $P < 0.005$ level.

Other than employment, no other proxies of severity

of illness available for this sample of patients (global clinical impression, history of suicide attempts, clozapine usage, depot medication, marital status) showed any difference between the two groups.

The finding that, in schizophrenia, speaking a second language expands job opportunities, is highly relevant because, by a recent estimate, only 15.85% of individuals with schizophrenia throughout the world are gainfully employed, although 50% are judged employable^[73]. Although this may be truer in Canada than elsewhere (because Canada is officially a bilingual French-English nation), bilingualism in patients with schizophrenia may prove to be an important factor in employability.

LIMITATIONS

This review has attempted to collect the literature on bilingualism and schizophrenia. The literature is sparse and conclusions remain speculative because little direct research has been done in this area.

DISCUSSION

This review has examined the literature on whether or not individuals with schizophrenia can learn a second language in adulthood and it appears that they indeed can and do. The benefits of knowing a second language are well described in the general literature, and there are theoretical reasons why bilingualism should, therefore, also benefit patients with schizophrenia. There is evidence that both native and later-learned languages are affected by the schizophrenia process, which suggests that assessment is best done in all the patient's languages whenever that is possible. A small literature on the optimal language of therapy implies that therapy in the non-native language might serve best for patients with schizophrenia. Finally, available evidence suggests that a second language might improve outcome in schizophrenia by decreasing social isolation and stigma and that it may increase the chance of employment.

CONCLUSION

The literature is sparse and overly based on small samples, making definitive statements impossible, but individuals with schizophrenia appear able to learn new languages as adults. Learning a foreign language may serve as an effective form of both cognitive and social rehabilitation. This literature review recommends research into the effects of bilingualism on various outcomes in schizophrenia.

REFERENCES

- 1 **Covington MA**, He C, Brown C, Naçi L, McClain JT, Fjordbak BS, Semple J, Brown J. Schizophrenia and the structure of language: the linguist's view. *Schizophr Res* 2005; **77**: 85-98

- 2 **Kim SJ**, Shim JC, Kong BG, Kang JW, Moon JJ, Jeon DW, Jung SS, Seo BJ, Jung DU. The Relationship between Language Ability and Cognitive Function in Patients with Schizophrenia. *Clin Psychopharmacol Neurosci* 2015; **13**: 288-295 [PMID: 26598588 DOI: 10.9758/cpn.2015.13.3.288]
- 3 **Kuperberg GR**. Language in schizophrenia Part I: an Introduction. *Lang Linguist Compass* 2010; **4**: 576-589 [PMID: 20936080 DOI: 10.1111/j.1749-818X.2010.00216.x]
- 4 **Seeman MV**. Analysis of psychotic language--a review. *Dis Nerv Syst* 1970; **31** Suppl: 92-99 [PMID: 4924736]
- 5 **Leitman DI**, Foxe JJ, Butler PD, Saperstein A, Revheim N, Javitt DC. Sensory contributions to impaired prosodic processing in schizophrenia. *Biol Psychiatry* 2005; **58**: 56-61 [PMID: 15992523 DOI: 10.1016/j.biopsych.2005.02.034]
- 6 **Rochester SR**, Harris J, Seeman MV. Sentence processing in schizophrenic listeners. *J Abnorm Psychol* 1973; **82**: 350-356 [PMID: 4754377]
- 7 **Lorch M**. Written language production disorders: historical and recent perspectives. *Curr Neurol Neurosci Rep* 2013; **13**: 369 [PMID: 23793932 DOI: 10.1007/s11910-013-0369-9]
- 8 **Walenski M**, Weickert TW, Maloof CJ, Ullman MT. Grammatical processing in schizophrenia: evidence from morphology. *Neuropsychologia* 2010; **48**: 262-269 [PMID: 19766129 DOI: 10.1016/j.neuropsychologia.2009.09.012]
- 9 **Tan EJ**, Thomas N, Rossell SL. Speech disturbances and quality of life in schizophrenia: differential impacts on functioning and life satisfaction. *Compr Psychiatry* 2014; **55**: 693-698 [PMID: 24315617 DOI: 10.1016/j.comppsy.2013.10.016]
- 10 **Seeman MV**, Cole HJ. The effect of increasing personal contact in schizophrenia. *Compr Psychiatry* 1977; **18**: 283-293 [PMID: 858246 DOI: 10.1016/0010-440X(77)90024-4]
- 11 **Walder DJ**, Seidman LJ, Cullen N, Su J, Tsuang MT, Goldstein JM. Sex differences in language dysfunction in schizophrenia. *Am J Psychiatry* 2006; **163**: 470-477 [PMID: 16513869 DOI: 10.1176/appi.ajp.163.3.470]
- 12 **Harris MJ**, Jeste DV. Late-onset schizophrenia: an overview. *Schizophr Bull* 1988; **14**: 39-55 [PMID: 3291094 DOI: 10.1093/schbul/14.1.39]
- 13 **Brüne M**, Bodenstern L. Proverb comprehension reconsidered--'theory of mind' and the pragmatic use of language in schizophrenia. *Schizophr Res* 2005; **75**: 233-239 [PMID: 15885515 DOI: 10.1016/j.schres.2004.11.006]
- 14 **Kiang M**, Light GA, Prugh J, Coulson S, Braff DL, Kutas M. Cognitive, neurophysiological, and functional correlates of proverb interpretation abnormalities in schizophrenia. *J Int Neuropsychol Soc* 2007; **13**: 653-663 [PMID: 17521483 DOI: 10.1017/S155617707070816]
- 15 **Mossaheb N**, Aschauer HN, Stoettner S, Schmoeger M, Pils N, Raab M, Willinger U. Comprehension of metaphors in patients with schizophrenia-spectrum disorders. *Compr Psychiatry* 2014; **55**: 928-937 [PMID: 24556517 DOI: 10.1016/j.comppsy.2013.12.021]
- 16 **Marengo JT**, Harrow M, Lanin-Kettering I, Wilson A. Evaluating bizarre-idiosyncratic thinking: a comprehensive index of positive thought disorder. *Schizophr Bull* 1986; **12**: 497-511 [PMID: 3764365 DOI: 10.1093/schbul/12.3.497]
- 17 **Chaika E**. Thought disorder or speech disorder in schizophrenia? *Schizophr Bull* 1982; **8**: 587-594 [PMID: 7178844 DOI: 10.1093/schbul/8.4.587]
- 18 **Rochester S**, Martin JR. Crazy Talk: A Study of the Discourse of Schizophrenic Speakers. New York: Plenum Press, 1979
- 19 **Goren A**, Swindell C, Khan A. Expressive language characteristics of schizophrenic subjects with different medication histories. *J Neurolinguistics* 1992; **7**: 67-90 [DOI: 10.1016/0911-6044(92)90011-K]
- 20 **Hymowitz P**, Spohn H. The effects of antipsychotic medication on the linguistic ability of schizophrenics. *J Nerv Ment Dis* 1980; **168**: 287-296 [PMID: 6102593]
- 21 **Salomé F**, Boyer P, Fayol M. The effects of psychoactive drugs and neuroleptics on language in normal subjects and schizophrenic

- patients: a review. *Eur Psychiatry* 2000; **15**: 461-469 [PMID: 11175923 DOI: 10.1016/S0924-9338(00)00520-4]
- 22 **Angwin AJ**, Arnott WL, Copland DA, Haire MP, Murdoch BE, Silburn PA, Chenery HJ. Semantic activation in Parkinson's disease patients on and off levodopa. *Cortex* 2009; **45**: 950-959 [PMID: 19356748 DOI: 10.1016/j.cortex.2009.02.012]
- 23 **Roesch-Ely D**, Weiland S, Scheffel H, Schwaninger M, Hundemer HP, Kolter T, Weisbrod M. Dopaminergic modulation of semantic priming in healthy volunteers. *Biol Psychiatry* 2006; **60**: 604-611 [PMID: 16603132 DOI: 10.1016/j.biopsych.2006.01.004]
- 24 **White TP**, Francis ST, Joseph V, O'Regan E, Head KE, Liddle PF. Evidence for reduced somatosensory lateralisation and focalisation in schizophrenia. *Psychiatry Res* 2009; **174**: 24-31 [PMID: 19796920 DOI: 10.1016/j.psychres.2009.04.004]
- 25 **Docherty NM**. Cognitive impairments and disordered speech in schizophrenia: thought disorder, disorganization, and communication failure perspectives. *J Abnorm Psychol* 2005; **114**: 269-278 [PMID: 15869357 DOI: 10.1037/0021-843X.114.2.269]
- 26 **Alladi S**, Bak TH, Duggirala V, Surampudi B, Shailaja M, Shukla AK, Chaudhuri JR, Kaul S. Bilingualism delays age at onset of dementia, independent of education and immigration status. *Neurology* 2013; **81**: 1938-1944 [PMID: 24198291 DOI: 10.1212/01.wnl.0000436620.33155.a4]
- 27 **Bialystok E**, Craik FI, Binns MA, Oshser L, Freedman M. Effects of bilingualism on the age of onset and progression of MCI and AD: evidence from executive function tests. *Neuropsychology* 2014; **28**: 290-304 [PMID: 24245925 DOI: 10.1037/neu0000023]
- 28 **Craik FI**, Bialystok E, Freedman M. Delaying the onset of Alzheimer disease: bilingualism as a form of cognitive reserve. *Neurology* 2010; **75**: 1726-1729 [PMID: 21060095 DOI: 10.1212/WNL.0b013e3181fe2alc]
- 29 **Schweizer TA**, Ware J, Fischer CE, Craik FI, Bialystok E. Bilingualism as a contributor to cognitive reserve: evidence from brain atrophy in Alzheimer's disease. *Cortex* 2012; **48**: 991-996 [PMID: 21596373 DOI: 10.1016/j.cortex.2011.04.009]
- 30 **Abutalebi J**, Della Rosa PA. How the brain acquires, processes, and controls a second language. In: Faust M, editor. *The Handbook of the Neuropsychology of Language*. Hoboken, New Jersey: Wiley-Blackwell, 2012: 516-538
- 31 **Gold BT**, Kim C, Johnson NF, Kryscio RJ, Smith CD. Lifelong bilingualism maintains neural efficiency for cognitive control in aging. *J Neurosci* 2013; **33**: 387-396 [PMID: 23303919 DOI: 10.1523/JNEUROSCI.3837-12.2013]
- 32 **Baum S**, Titone D. Moving towards a neuroplasticity view of bilingualism, executive control, and aging. *Appl Psycholinguist* 2014; **35**: 857-894 [DOI: 10.1017/S0142716414000174]
- 33 **Kroll JF**. On the consequences of bilingualism: We need language and the brain to understand cognition. *Biling-Lang Cogn* 2015; **18**: 32-34 [DOI: 10.1017/S1366728914000637]
- 34 **Green DW**, Abutalebi J. Language control in bilinguals: The adaptive control hypothesis. *J Cogn Psychol (Hove)* 2013; **25**: 515-530 [PMID: 25077013]
- 35 **Hommel B**, Colzato LS, Fischer R, Christoffels IK. Bilingualism and creativity: benefits in convergent thinking come with losses in divergent thinking. *Front Psychol* 2011; **2**: 273 [PMID: 22084634 DOI: 10.3389/fpsyg.2011.00273]
- 36 **Luk G**, Bialystok E. Bilingualism is not a categorical variable: Interaction between language proficiency and usage. *J Cogn Psychol (Hove)* 2013; **25**: 605-621 [PMID: 24073327 DOI: 10.1080/020445911.2013.795574]
- 37 **Valian V**. Bilingualism and cognition. *Biling-Lang Cogn* 2014; **18**: 3-24 [DOI: 10.1017/S1366728914000522]
- 38 **de Bruin A**, Treccani B, Della Sala S. Cognitive advantage in bilingualism: an example of publication bias? *Psychol Sci* 2015; **26**: 99-107 [PMID: 25475825 DOI: 10.1177/0956797614557866]
- 39 **Marinova-Todd SH**, Marshall DB, Snow CE. Three misconceptions about age and L2 learning. *TESOL Q* 2000; **34**: 9-34 [DOI: 10.2307/3588095]
- 40 **Genesee F**. Myths about early childhood bilingualism. *Can Psychol* 2015; **56**: 6-15 [DOI: 10.1037/a0038599]
- 41 **Bersudsky Y**, Fine J, Gorjaltsan I, Chen O, Walters J. Schizophrenia and second language acquisition. *Prog Neuropsychopharmacol Biol Psychiatry* 2005; **29**: 535-542 [PMID: 15866355 DOI: 10.1016/j.pnpbp.2005.01.004]
- 42 **Smirnova D**, Walters J, Fine J, Muchnik-Rozanov Y, Paz M, Lerner V, Belmaker RH, Bersudsky Y. Second language as a compensatory resource for maintaining verbal fluency in bilingual immigrants with schizophrenia. *Neuropsychologia* 2015; **75**: 597-606 [PMID: 26162616 DOI: 10.1016/j.neuropsychologia.2015.06.037]
- 43 **Pliatsikas C**, Moschopoulou E, Saddy JD. The effects of bilingualism on the white matter structure of the brain. *Proc Natl Acad Sci USA* 2015; **112**: 1334-1337 [PMID: 25583505 DOI: 10.1073/pnas.1414183112]
- 44 **Li P**, Legault J, Litcofsky KA. Neuroplasticity as a function of second language learning: anatomical changes in the human brain. *Cortex* 2014; **58**: 301-324 [PMID: 24996640 DOI: 10.1016/j.cortex.2014.05.001]
- 45 **Roche E**, Segurado R, Renwick L, McClenaghan A, Sexton S, Frawley T, Chan CK, Bonar M, Clarke M. Language disturbance and functioning in first episode psychosis. *Psychiatry Res* 2016; **235**: 29-37 [PMID: 26699880 DOI: 10.1016/j.psychres.2015.12.008]
- 46 **Antonioni M**, Gunasekera GM, Wong PC. Foreign language training as cognitive therapy for age-related cognitive decline: a hypothesis for future research. *Neurosci Biobehav Rev* 2013; **37**: 2689-2698 [PMID: 24051310 DOI: 10.1016/j.neubiorev.2013.09.004]
- 47 **De Zulueta FI**, Gene-Cos N, Grachev S. Differential psychotic symptomatology in polyglot patients: Case reports and their implications. *Br J Med Psychol* 2001; **74** Part 3: 277-292 [PMID: 11802842 DOI: 10.1348/000711201160966]
- 48 **Theron J**. Pragmatic assessment of schizophrenic bilinguals' L1 and L2 use: A comparison of three assessment tools. Thesis, Department of General Linguistics, University of Stellenbosch, 2009. Available from: URL: <https://scholar.sun.ac.za/handle/10019.1/1783>
- 49 **Southwood F**, Schoeman R, Emsley R. Bilingualism and psychosis: a linguistic analysis of a patient with differential symptom severity across languages. *So Afr Linguist Appl* 2009; **27**: 163-171 [DOI: 10.2989/salals.2009.27.2.4.867]
- 50 **Armon-Lotem S**, Walters J. An approach to differentiating bilingualism and language impairment. In: Guendouzi J, Loncke F, Williams MJ, editors. *The Handbook of Psycholinguistic and Cognitive Processes: Perspectives in Communication Disorders*. Hove, United Kingdom: Taylor & Francis Ltd, 2010: 465-489
- 51 **Dugan JE**. Second language acquisition and schizophrenia. *Second Lang Res* 2014; **30**: 307-321 [DOI: 10.1177/0267658314525776]
- 52 **Paradis M**. Bilingualism and neuropsychiatric disorders. *J Neurolinguistics* 2008; **21**: 199-230 [DOI: 10.1016/j.jneuroling.2007.09.002]
- 53 **Schoeman R**, Chiliza B, Emsley R, Southwood F. Bilingualism and psychosis: a case report. *Schizophr Res* 2008; **103**: 333-335 [PMID: 18485673 DOI: 10.1016/j.schres.2008.03.019]
- 54 **Wang JH**, Morales O, Hsu LK. Auditory hallucinations in bilingual immigrants. *J Nerv Ment Dis* 1998; **186**: 501-503 [PMID: 9717869]
- 55 **Krapf EE**. The choice of language in polyglot psychoanalysis. *Psychoanal Q* 1955; **24**: 343-357 [PMID: 13245891 DOI: 10.1080/10481885.2014.870836]
- 56 **Marcos LR**. Bilinguals in psychotherapy: language as an emotional barrier. *Am J Psychother* 1976; **30**: 552-560 [PMID: 984259]
- 57 **Javier RA**. Linguistic considerations in the treatment of bilinguals. *Psychoanal Psychol* 1989; **6**: 87-96 [DOI: 10.1037/0736-9735.6.1.87]
- 58 **Byford A**. Lost and gained in translation: The impact of bilingual clients' choice of language in psychotherapy. *Br J Psychother* 2015; **31**: 333-347 [DOI: 10.1111/bjp.12148]
- 59 **Javier RA**. Vicissitudes of autobiographical memories in a bilingual analysis. *Psychoanal Psychol* 1995; **12**: 429-438 [DOI: 10.1037/h0079703]
- 60 **Foster RP**. The bilingual self: Duet in two voices. *Psychoanal Dialogues* 1996; **6**: 99-121 [DOI: 10.1080/10481889609539109]
- 61 **Foster RP**. Psychoanalysis and the bilingual patient: Some observations on the influence of language choice on the transference. *Psychoanal Psychol* 1992; **9**: 61-76 [DOI: 10.1037/h0079325]

- 62 **Hill S.** Language and intersubjectivity: Multiplicity in a bilingual treatment. *Psychoanal Dialogues* 2008; **18**: 437-455 [DOI: 10.1080/10481880802196966]
- 63 **Katsavdakis KA,** Sayed M, Bram A, Bartlett AB. How was this story told in the mother tongue? An integrative perspective. *Bull Menninger Clin* 2001; **65**: 246-265 [PMID: 11407145 DOI: 10.1521/bumc.65.2.246.19403]
- 64 **Mohammad SAN,** Jesús GJ. The bilingual self or selves. *Int J Lang Studies* 2014; **8**: 107-116 [DOI: 10.13140/2.1.2463.8086]
- 65 **Kokaliari E,** Catanzarite G, Berzoff J. It is called a mother tongue for a reason: A qualitative study of therapists' perspectives on bilingual psychotherapy-treatment implications. *Smith College Studies Soc Work* 2013; **83**: 97-118 [DOI: 10.1080/00377317.2013.747396]
- 66 **Pesner JW,** Auld F. The relationship between bilingual proficiency and self-esteem. *Int J Intercultural Rel* 1980; **4**: 339-351 [DOI: 10.1016/0147-1767(80)90009-7]
- 67 **Pullmann H,** Allik J. Relations of academic and general self-esteem to school achievement. *Personality Individ Diff* 2008; **45**: 559-564 [DOI: 10.1016/j.paid.2008.06.017]
- 68 **Abdel-Baki A,** Ouellet-Plamondon C, Medrano S, Nicole L, Rousseau C. Immigrants' outcome after a first-episode psychosis. *Early Interv Psychiatry* 2015 Nov 29; Epub ahead of print [PMID: 26616492 DOI: 10.1111/eip.12302]
- 69 **Bentall RP,** Fernyhough C. Social predictors of psychotic experiences: specificity and psychological mechanisms. *Schizophr Bull* 2008; **34**: 1012-1020 [PMID: 18703667 DOI: 10.1093/schbul/sbn103]
- 70 **Matulis AC.** Schizophrenia: Experiment in teaching a new foreign language to inpatients as an analeptic ego aid. *Dynamische Psychiatrie* 1977; **10**: 459-472
- 71 **Davidson M,** Kapara O, Goldberg S, Yoffe R, Noy S, Weiser M. A Nation-Wide Study on the Percentage of Schizophrenia and Bipolar Disorder Patients Who Earn Minimum Wage or Above. *Schizophr Bull* 2016; **42**: 443-447 [PMID: 25796051 DOI: 10.1093/schbul/sbv023]
- 72 **Fry R,** Lowell BL. The value of bilingualism in the US labor market. *Indust Labor Rel Rev* 2003; **57**: 128-140 [DOI: 10.2307/3590985]
- 73 **Zaprutko T,** Kus K, Bilobryvka R, Rakhman L, Göder R, Michalak M, Pogłodziński A, Nowakowska E. Schizophrenia and Employment: Evaluation From Professionals Point of View. *Psychiatr Q* 2015; **86**: 569-579 [PMID: 25736799 DOI: 10.1007/s11126-015-9354-6]

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