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Bilingualism, dementia and the tale of many variables:  
why we need to move beyond the Western World

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Commentary on Lawton et al. (2015) and Fuller-Thomson (in press)

The question whether bilingualism can affect cognitive functions and delay the onset of dementia is a controversial one. We comment on a recent paper, which found no significant differences in the onset of dementia between mono- and bilingual subjects (Lawton, Gasquoine, & Weimer, 2015) and a subsequent commentary calling into question the validity of previous studies reporting such a difference (Fuller-Thomson, in press). We focus on the contentious issue of confounding variables, central to both papers. While a full discussion of this topic is beyond our scope – for a recent review, see Bak (in press) - we address three aspects emphasised by Fuller-Thomson: *immigration*, *education* and *data collection*. We argue that extending bilingualism research beyond the Western World can reduce confounds and introduce new perspectives.

### Immigration

Immigration has been arguably the most debated confounding variable in the studies of bilingualism and dementia and has played a central role in the criticism of the first papers on this topic (Bialystok, Craik, & Freedman, 2007; Craik, Bialystok, & Freedman, 2010; Schweizer, Ware, Fischer, Craik, & Bialystok, 2012), comparing bilinguals with frequent immigration background with a predominantly monolingual autochthonous population. In such case, “The healthy migrant effect may confound the link between bilingualism and delayed onset of Alzheimer’s disease” (Fuller-Thomson & Kuh, 2014).

A prominent finding of Lawton and colleagues is the *lack of influence* of immigration status on dementia. Accordingly, Fuller-Thomson could have entitled her comment: “*Emerging evidence against the healthy migrant effect*”. However, we would be ourselves the first ones to argue against such an oversimplification. The evidence suggesting that migrants might be in some respects different from both their original and their host populations (Fuller-Thomson & Kuh, 2014) is not made invalid by a study failing to find such a difference. Neither is it made invalid by our own studies, demonstrating bilingualism effects in

populations without any immigrants (Alladi et al., 2013; Bak, Nissan, Allerhand, & Deary, 2014). If we broaden our research to include populations in which bilingualism and immigration do not necessarily go hand in hand (e.g. India), we can dissociate the two phenomena remarkably well. In places where they are associated, we should not play one against the other, but explore both of them as well as their interaction.

### Education

Another important variable in Fuller-Thomson's commentary is education, "*one of the factors most consistently associated with a later onset of dementia*". This has been the case in the majority of studies (Sharp & Gatz, 2011), but the effect has not always been replicated (Cobb et al., 1995; Gatz et al., 2001) and could depend on interaction with other variables. Low education increases the risk of dementia only in combination with certain variables such as rural residence (Hall, Gao, Unverzagt, & Hendrie, 2000), or female gender (Ott et al., 1999). In parts of India, where many illiterates are integrated into the society, the association between education and dementia onset is no longer significant after adjusting for bilingualism, occupation and rural dwelling (Iyer et al., 2014). The bilingual delay in the onset of dementia in illiterates without any formal education is larger than in the general population (Alladi et al., 2013).

In the Sacramento longitudinal study of ageing from which Lawton et al. study's population is derived, the cognitive benefit of high education was found to decrease with increased cardiovascular risk (Al Hazzouri et al., 2013). Even in Lawton et al, contrary to the expectations, the age at diagnosis of dementia was not delayed by education. Accordingly, another possible title for Fuller-Thomson's comment could have been: "*Emerging evidence against an influence of education on the age of onset of dementia*". The association between low education and dementia is complex and possibly culture-specific.

### Data collection

Both, Lawton et al. and Fuller-Thomson stress the value of the *community-based studies* and the advantages of *age of diagnosis* rather than *age of the first symptoms* as outcome variable. We agree – up to a point. The value of community-based approach does not invalidate studies in *memory clinics*. The important advantage of the latter is the depth and quality of information that can be collected. The Hyderabad study, for instance, included a multidimensional cognitive assessment of all patients, interviewed and tested in their strongest language by staff members fluent in that language, including tests specially designed and validated for illiterates (Mekala, Alladi, Mridula, & Kaul, 2008). Only few large community studies can provide the same.

Likewise, we recognise the problems associated with the age of onset as outcome variable (e.g. the subjectivity in the recall of symptoms), but taking the age of diagnosis as outcome has its problems too. Both depend upon many variables, including the nature of symptoms,

their perception, diagnostic tests, complexity of daily activities and patient-physician interaction (Bradford, Kunik, Schulz, Williams & Singh, 2009). Indeed, a recent study found a slightly larger bilingual delay in dementia presentation for the age of diagnosis than for the age of onset (Woumans et al., 2014).

### Towards a world-wide perspective

Interestingly, all four studies cited by Fuller-Thomson as evidence against bilingualism effects come from a country with an ambiguous attitude towards bilingualism: the USA. In contrast, much of the positive evidence comes from countries with a positive attitude: India, Canada, Luxembourg or Belgium. Positive and negative attitudes to bilingualism, often implicit and difficult to determine, can have a profound influence on patients' lives and on the minds of the physicians diagnosing dementia. One way to address this problem is to extend bilingualism research to countries with fundamentally different societies and cultures. As discussed regarding immigration and education, results from many parts of the world do not follow Western patterns. In many places bilingualism is the default rather than exception (Bak & Alladi, 2014). Differences in sociolinguistic variables such as patterns of language switching (Freedman et al., 2014) might have implications for cognitive functions and dementia (Abutalebi & Green, 2007; Green, 2011). With global increase in dementia burden, it is important to pursue all avenues identifying potential risk and protective factors, including, among others, bilingualism. Bertrand Russell once admitted: "*In the course of my travels, the belief that everything worth knowing was known at Cambridge gradually wore off*" (Russell, 1967). So maybe not everything that can be known about bilingualism can be known in the Western World.

### References:

- Abutalebi, J., & Green, D. (2007). Bilingual language production: The neurocognition of language representation and control. *Journal of Neurolinguistics*, 20(3), 242-275.
- Al Hazzouri, A. Z., Haan, M. N., Neuhaus, J. M., Pletcher, M., Peralta, C. A., & López, L. (2013). Cardiovascular risk score, cognitive decline, and dementia in older Mexican Americans: the role of sex and education. *Journal of the American Heart Association*, 2(2), e004978.
- Alladi, S., Bak, T. H., Duggirala, V., Surampudi, B., Shailaja, M., Shukla, A. K., . . . Kaul, S. (2013). Bilingualism delays age at onset of dementia, independent of education and immigration status. *Neurology*, 81(22), 1938-1944.
- Bak, T., H., & Alladi, S. (2014). Can being bilingual affect the onset of dementia? *Future Neurology*, 9(2), 101-103.
- Bak, T. H. (in press). The impact of bilingualism on cognitive aging and dementia: finding a path through a forest of confounding variables. *Linguistic Approaches to Bilingualism*, Special Issue on Bilingualism and Ageing.

- Bak, T. H., Nissan, J. J., Allerhand, M. M., & Deary, I. J. (2014). Does bilingualism influence cognitive aging? *Annals of Neurology*.
- Bialystok, E., Craik, F. I., & Freedman, M. (2007). Bilingualism as a protection against the onset of symptoms of dementia. *Neuropsychologia*, 45(2), 459-464.
- Bradford, A., Kunik, M. E., Schulz, P., Williams, S. P., & Singh, H. (2009). Missed and delayed diagnosis of dementia in primary care: prevalence and contributing factors. *Alzheimer disease and associated disorders*, 23(4), 306.
- Cobb JL, Wolf PA, Au R, White R, D'Agostino RB. (1995).The effect of education on the incidence of dementia and Alzheimer's disease in the Framingham Study. *Neurology*, 45(9),1707-1712.
- Craik, F. I., Bialystok, E., & Freedman, M. (2010). Delaying the onset of Alzheimer disease Bilingualism as a form of cognitive reserve. *Neurology*, 75(19), 1726-1729.
- Freedman, M., Alladi, S., Chertkow, H., Bialystok, E., Craik, F. I., Phillips, N. A., . . . Bak, T. H. (2014). Delaying Onset of Dementia: Are Two Languages Enough? *Behavioural Neurology*, 2014.
- Fuller-Thomson, E. (in press). Emerging evidence contradicts the hypothesis that bilingualism delays dementia onset. A Commentary on "Age of dementia diagnosis in community dwelling bilingual and monolingual Hispanic Americans" by Lawton et al., 2014. *Cortex*.
- Fuller-Thomson, E., & Kuh, D. (2014). The healthy migrant effect may confound the link between bilingualism and delayed onset of Alzheimer's disease. *Cortex*; 52, 128.
- Gatz M, Svedberg P, Pedersen NL, Mortimer JA, Berg S, Johansson B. (2001)Education and the risk of Alzheimer's disease: findings from the study of dementia in Swedish twins. *J Gerontol B Psychol Sci Soc Sci.*, 56(5), P292-300.
- Green, D. W. (2011). Language control in different contexts: the behavioral ecology of bilingual speakers. *Frontiers in psychology*, 2.
- Hall, K. S., Gao, S., Unverzagt, F. W., & Hendrie, H. C. (2000). Low education and childhood rural residence Risk for Alzheimer's disease in African Americans. *Neurology*, 54(1), 95-95.
- Iyer, G. K., Alladi, S., Bak, T. H., Shailaja, M., Mamidipudi, A., & Rajan, A. (2014). Dementia in developing countries: does education play the same role in India as in the West? *Dement. neuropsychol*, 8(2).
- Lawton, D. M., Gasquoine, P. G., & Weimer, A. A. (2015). Age of dementia diagnosis in community dwelling bilingual and monolingual Hispanic Americans. *Cortex*: 66, 141-145.
- Mekala, S., Alladi, S., Mridula, K. R., & Kaul, S. (2008). Dementia diagnosis in illiterates: Adaptation and usefulness of a global cognitive screening test-Addenbrooke's Cognitive Examination Revised (ACE-R). *Annals of Indian Academy of Neurology*, 11.
- Ott A, van Rossum CTM, van Harskamp F, et al. (1999) Education and the incidence of dementia in a large population-based study: the Rotterdam study. *Neurology*, 52, 663-666.

Russell, B. (1967). *The Autobiography of Bertrand Russell: Vol.: 1:(1872-1914)*: 1967: George Allen and Unwin Limited.

Schweizer, T. A., Ware, J., Fischer, C. E., Craik, F. I., & Bialystok, E. (2012). Bilingualism as a contributor to cognitive reserve: Evidence from brain atrophy in Alzheimer's disease. *Cortex*, 48(8), 991-996.

Sharp, E. S., & Gatz, M. (2011). The relationship between education and dementia an updated systematic review. *Alzheimer disease and associated disorders*, 25(4), 289.

Woumans, E., Santens, P., Sieben, P., Versijpt, J., Stevens, M., Duyck, W. (2014). Bilingualism delays clinical manifestation of Alzheimer's disease. *Bilingualism: Language and Cognition*. E-publication 29 December 2014.