

Commentary on Levels of Education and Normative Data in Neuropsychological Tests

Sierra Sanjurjo Natalia^{1-3*} and Torralva Teresa¹⁻³

¹Laboratory of Neuropsychology (LNPS) Institute of Cognitive and Translational Neuroscience (INCYT), INECO Foundation, Favaloro University, Argentina

²Institute of Neurosciences, Favaloro University, Buenos Aires, Argentina

³Australian Research Council Centre of Excellence in Cognition and its Disorders, Macquarie University, Sydney, Australia

One of the aims of neuropsychological assessment is the identification and classification of cognitive status. In this endeavor it is fundamental to compare the individual test score to scores obtained from a normative population. There is evidence that demographic factors exert influence on performance of neuropsychological tests [1-3]. A variety of studies have consistently reported negative correlations between different neuropsychological test scores and years of education, healthy adults with more years of schooling surpass those with lower in diverse cognitive tests [4,5]. Without appropriate knowledge about the impact of years of schooling on neuropsychological tests, false positive attributions may be routinely made [6]. Clinicians might overestimate cognitive impairment in individuals with limited education, as Ponton et al. [7] found, that non-demented individuals with less than 6 years of schooling score less than 2 standard deviations below average when compared with persons with 16 years of education. The aforementioned data stresses the value of analyze neuropsychological test scores considering education-adjusted norms.

The need for education-adjusted norms is essential when considering that more than three quarters of the world's population resides in developing countries [8]. The average years of education in Europe and Central Asia are 9.64 and as low as 7.09 in developing countries [9]. Dick et al. [10] underline the importance of considering education when interpreting neuropsychological scores of minority individuals in the US, bearing in mind that by the year of 2020 a third of the aged in United States will come from minority groups. The increasing number of low level educated adults in developing countries as a result of global migration (e.g. refugees, displaced workers, etc.) highlights the need of context-sensitive assessment tools to work with diverse cultural groups and education levels.

Despite the fact that the National Institute of Health underlined the need for investigating the contribution of education and cultural backgrounds in current neuropsychological instruments, relatively little work has been directed towards understanding the effects of the years of education achieved on neuropsychological test score. In fact, most of the studies reporting norms of screening cognitive tools have been derived from adult groups with 10 or more years of schooling [11]. This is particularly relevant given the fact that low level of education is consider a potential risk factor for cognitive decline and adults with less years of education are more susceptible to be label as cognitive impaired [12].

In our study we analyze the influence of age and years of schooling on a neuropsychological test (IFS - Ineco Frontal Screening) score to derive norms for clinical purposes [13]. Clinical evaluation of executive functions can be enhanced both in celerity and accuracy by the use if the IFS [14,15]. Through a multiple linear regression, we measure the impact of years of schooling in an undivided demographically composite of 161 healthy adults (wide range of years of education), modify the initial score by adding/subtracting the impact of years of schooling and then derive norms from the modified score.

The IFS presented a moderate and significant association with level of education. Ceiling effects were displayed at the motor-programming and conflicting instructions subtests; a failure on these subtests is

uncommon in individuals who attained few years of formal instruction. Likewise the subtest mostly affected by years of education was backward digit span. Our data proved that correction for years of schooling is fundamental for IFS interpretation. Thereby, an IFS score could be wrongly interpreted as an indicator of flawed executive functions in a low educated patient if the score is not corrected by years of schooling.

Our research study highlights the usefulness of gathering education-adjusted norms in favour of avoid misinterpretations of raw scores and prevent false-positive or false-negative cases. Absence of normative scores for adults with less years of formal instruction may wrongly prompt to label them as cognitive declined. The normative data we recently published might be useful in clinical practice for the analysis of IFS in patients who attained low level of education.

References

1. Ganguli M, Snitz BE, Lee CW, Vanderbilt J, Saxton JA, et al. (2010) Age and education effects and norms on a cognitive test battery from a population based cohort: The Monongahela-Youghioheny Healthy Aging Team. *Aging Ment Health* 14: 100-107.
2. Llorente A (2008) Hispanic population: Special issues in neuropsychology. *Principles of Neuropsychological assessment with hispanics*. Springer, pp: 47-56.
3. Pavão Martins I, Maruta C, Freitas V, Mares I (2013) Executive performance in older Portuguese adults with low education. *Clin Neuropsychol* 27: 410-425.
4. Ardila A, Ostrosky-Solis F, Rosselli M, Gomez C (2000) Age-related cognitive decline during normal aging: The complex effect of education. *Arch Clin Neuropsychol* 15: 495-513.
5. Yassuda MS, Diniz BS, Flaks MK, Viola LF, Pereira FS, et al. (2009) Neuropsychological profile of Brazilian older adults with heterogeneous educational backgrounds. *Arch Clin Neuropsychol* 24: 71-79.
6. Ferraro FR (2002) *Minority and cross-cultural aspects of neuropsychological assessment*. CRC Press.
7. Pontón MO, Satz P, Herrera L, Ortiz F, Urrutia CP, et al. (1996) Normative data stratified by age and education for the Neuropsychological Screening Battery for Hispanics (NeSBHIS): Initial report. *J Int Neuropsychol Soc* 2: 96-104.
8. <http://databank.worldbank.org/data/download/POP.pdf>
9. Barro RJ, Lee JW (2013) A new data set of educational attainment in the world, 1950-2010. *J Dev Econ* 104: 184-198.
10. Dick MB, Teng EL, Kempler D, Davis DS, Taussig IM (2002) The cross-cultural neuropsychological test battery (CCNB): Effects of age, education, ethnicity and cognitive status on performance. American Psychological Association.

*Corresponding author: Sierra Sanjurjo Natalia, Laboratory of Neuropsychology (LNPS), Institute of Cognitive and Translational Neuroscience (INCYT), INECO Foundation, Favaloro University, Buenos Aires, Argentina, E-mail: nsierra@ffavaloro.org

Received April 13, 2018; Accepted April 27, 2018; Published April 30, 2018

Citation: Natalia SS, Teresa T (2018) Commentary on Levels of Education and Normative Data in Neuropsychological Tests. *Int J Neurorehabilitation* 5: 316. doi: 10.4172/2376-0281.1000316

Copyright: © 2018 Natalia SS, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

11. Busch RM, Chapin JS (2008) Review of normative data for common screening measures used to evaluate cognitive functioning in elderly individuals. *Clin Neuropsychol* 22: 620-650.
12. Brayne C, Ince PG, Keage HA, McKeith IG, Matthews FE, et al. (2010) Education, the brain and dementia: Neuroprotection or compensation? *Brain* 133: 2210-2216.
13. Sierra Sanjurjo N, Saraniti AB, Gleichgerrcht E, Roca M, Manes F, et al. (2018) The IFS (INECO Frontal Screening) and level of education: Normative data. *Appl Neuropsychol Adult* 12: 1-9.
14. Torralva T, Roca M, Gleichgerrcht E, López P, Manes F (2009) INECO Frontal Screening (IFS): A brief, sensitive, and specific tool to assess executive functions in dementia. *J Int Neuropsychol Soc* 15: 777-786.
15. Moreira HS, Lima CF, Vicente SG (2014) Examining executive dysfunction with the institute of cognitive neurology (INECO) frontal screening (IFS): Normative values from a healthy sample and clinical utility in Alzheimer's disease. *J Alzheimers Dis* 42: 261-273.