Neuropsychological Assessment
Sense and Sensibility

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See related article, pages 2969–2972.

Research on vascular factors in dementia and vascular cognitive impairment has gone through some major developments in the past decades. Until 1993, the term multi-infarct dementia was used to distinguish dementia caused by one or more infarctions from Alzheimer disease. Research on cognitive functioning aimed at obvious cognitive impairment after a stroke, that was generally quantified with dementia screening methods. In 1993, the first set of diagnostic criteria of vascular dementia was introduced, which led to an expansion in the number of publications on the subject. In these criteria, several vascular mechanisms, pathology, and circumscript lesions or localizations were defined that may lead to vascular dementia. As the field evolved, new insights arose, accompanied with the acknowledgment that not all cognitive decline fulfilled the criteria of dementia. The concept of vascular cognitive impairment was formulated as an umbrella term that encompasses all cognitive deficits associated with vascular factors or mechanisms. Meanwhile, several attempts have been made to further differentiate specific patterns of cognitive impairment related to distinct vascular pathology. Efforts have been made with regard to poststroke dementia and subcortical vascular ischemic dementia. Still, the number of publications on cognitive deficits related to vascular factors is growing, and presently several studies aim to objectify even more subtle cognitive changes.

In this issue of Stroke, for instance, Gunstad et al present data on neuropsychological test results in older adults with cardiovascular disease in relation to SELP 1087 G/A polymorphism and conclude that contrary to their expectations, patients with SELP 1087A allele performed more poorly on neuropsychological testing. The authors state that there were differences on “multiple tests in the attention/executive function/psychomotor speed domain” and on a memory index. However, they let the opportunity slip to put the results in perspective by placing them in a psychometric profile nor do they provide a possible explanation for their findings. Although Gunstad et al recognize the limitations of their study and suggest further research on the topic, they scarcely discuss the advantages and/or limitations of the neuropsychological methods used, which in itself might provide clues in understanding the data.

A well-performed neuropsychological examination provides a reliable method to quantify cognitive functioning, and some studies even state that a neuropsychological assessment may have a better predictive value in (preclinical) dementia than imaging techniques. An important advantage of neuropsychological testing is that it can provide useful information about cognitive functioning in a relatively short period of time, whereas the methods are relatively inexpensive and in general easily available. Due to these convenient benefits, one or more neuropsychological tests are often added to research protocols. However, although the field of neuropsychology has expanded and has taken enormous strides over the last decades, a neuropsychological assessment always goes with undesirable noise that has to be accounted for. Confounding, a frequent and inevitable phenomenon in neuropsychological practice, may obscure assessment of cognitive and behavioral functioning, which can be brought down to 2 major influences.

A substantial part of the undesirable and unintentional influences lies in the psychometric methods itself. Cognitive functions vary over time and are thought to be more or less hierarchical structured. This implies that some functions are indissolubly connected to one another, which in turn may affect individual test results. In a reliable test, all these factors are minimized, but some amount of variation cannot be ruled out. This causes a certain degree of uncertainty depending on the test. Due to the variability of cognitive functioning, decisions on the presence or absence of cognitive deficits should therefore be based on the results of more than one test on a specific domain. In their study, Gunstad et al used tests with sufficient reliability and validity, but they used only one test per cognitive domain. Although they do not elaborate on the selection of the test, the selection of a limited number of tests may be the result of the conflicting demands: a thorough neuropsychological assessment is time-consuming, whereas clinicians always seem to have a want of time and minimize the burden for the patient. However, if we really want to gain insight into the relationship of cognitive functioning and vascular mechanisms, we should invest in comprehensive neuropsychological assessment.

Another type of noise in neuropsychological testing is statistical confounding. This can occur when an extraneous factor is associated both with the studied determinant and the outcome variable, which may obscure relations between variables. Age, sex, level of education, and intelligence are potential confounders in studies of cognitive functioning.
Although these demographic characteristics were not significantly different between the 2 groups in the study of Gunstad et al., all were disadvantaged in the SELP A group, e.g., these patients had a higher mean age, lower educational level, and consisted of a larger proportion of women. Gunstad et al. used several statistical methods to rule out the influence of demographic factors, but due to the small group sizes and the large standard deviations, the small differences between the 2 groups are not convincing.

Neuropsychological performance can also be influenced by other factors that confound the test results. Some general confounding factors are common in all patients, like motivational problems, fear of failure, aggravation, fatigue, pain, emotional preoccupations, stress, mood disturbances, distractibility, and cultural background. These factors may influence neuropsychological test performance, and the neuropsychologist has to weigh the contribution of the confounders to the neuropsychological test results. Other confounding variables are found in specific diseases or patient groups. Performance in patients with stroke, for example, may be hampered by the direct consequences of a stroke such as hemiparesis, aphasia, or neglect.

From the preceding, it may have become clear that neuropsychological data need a sensible and balanced approach. A neuropsychological assessment should therefore be performed or supervised by a specialist in the field of neuropsychology and hence who has expertise in psychometrics. The key to adequate neuropsychological assessment is the use of reliable and valid tests with standardization of administration techniques and the use of reliable norms preferably stratified for age, sex, and educational level. The interpretation and integration of the information, including the observation of behavior, play a pivotal role.

Both neurology and clinical neuropsychology have experienced a rapid emergence and evolution in the past decades. If we want to continue to make progress in the understanding of all aspects of cognitive functioning, we should be aware of the complexity of this and the hierarchical structure. Both specialists have overlapping areas of knowledge and expertise, and a multidisciplinary cooperation that combines the strengths of both will be rewarding and successful in future research.

Disclosures

None.

References


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