

The Role of Real-Time Computerized Neuropsychological Examination in Forensic Psychiatry Practice

Semion Kertzman, MD,¹ Ilya Reznik, MD,² Haim Grinspan, MD,¹ Nina Shliapnicov, MD,¹ Moshe Birger, MD,^{1,3} Abraham Weizman, MD,^{2,3} and Moshe Kotler, MD^{1,3}

¹ Forensic Psychiatry Division, affiliated with Beer Yaakov Mental Health Center, Beer Yaakov, Israel

² Laboratory of Biological Psychiatry, Felsenstein Medical Research Center, Israel

³ Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

Abstract: Neuropsychological examination (NPE) is an important tool for evaluation of cognitive functioning in clinical and forensic situations. In forensic practice, NPE usually focuses on competency to stand trial, the mental state at the time of the offense, risk for future violence and malingering/aggravation issues. Real-time computerized NPE shows more accurate results than traditional pen-and-paper tests and provides quantitative data in a relatively standard format. It permits detection of any manipulation by the examinee in “real time.” Therefore, it makes it possible not only to analyze the final results, but also to monitor closely the sequence of single acts of the assessment procedure. Thus, the computerized NPE attenuates possible examinee-related manipulations, which may distort the test results. The real-time NPE report of these elementary behavioral parameters can be used in the courts as acceptable evidence under cross-examination. This method leaves less room for bias; however, a cautious interpretation is always essential since the computerized data do not transform subjective methods into objective ones. Establishing a standard testing procedure and further utilization of real-time computerized tools could improve significantly the quality of NPE in forensic psychiatric practice.

Introduction

Forensic mental health assessment is a form of evaluation performed by psychiatrists to provide relevant clinical data to legal decision makers or to the litigants involved in civil or criminal proceedings (1). The forensic psychiatrist consults an attorney in order to educate and instruct the latter on the clinical issues that are involved. Psychiatrists in a forensic context may offer optional evidence that represents conclusions drawn from the facts in a case (2). For a comprehensive psychiatric evaluation the psychiatrist should assess all pathological factors that may be relevant for a particular forensic situation. During court testimony the psychiatrist should clearly define the competency of the defendant to stand trial and his mental state at the time of the offense. Psychiatrists generally base their expert conclusions on clinical interviews and on collateral sources. Psychological tests are an additional source of relevant information (3, 4). Since *Jenkins vs. United States* (1962), the courts have

officially recognized psychologists as experts in forensic situations (5).

Forensic neuropsychological examination (NPE) is a new and rapidly growing subspecialty that applies neuropsychological principles and practices to matters that pertain to legal decision-making and provides the specific information regarding brain-behavior relationships (6). NPE is one of the major developments in the field of forensic psychiatry in recent years (7, 8).

The aim of this paper is to describe the current status of NPE in clinical forensic practice and to discuss the potential role of this instrument in improving detection of neurocognitive contributors to the complex phenomenon of criminal behavior.

What is neuropsychological examination (NPE)?

In a comprehensive evaluation of the mental status of a defendant, which includes clinical psychological analysis, it is essential to assess his cognitive abilities.

Cognition is the mental processes of knowing, thinking, learning, judging, and problem solving. Such evaluation should be used not only to detect dementia or mental retardation, but also to evaluate a widespread spectrum of cognitive abilities, which may contribute to criminal behavior.

Neurocognitive deficits may be involved particularly in lower behavioral control and may reduce the ability to behave in a socially appropriate manner. There is a rapidly accumulating body of knowledge related to the neurobiology of impulsive, violent and criminal behaviors based on multidisciplinary neuropsychological and neuroimaging studies (9–13). Combining NPE and neuroimaging may clarify the neurobiological substrate of such social deviant behaviors. Based on clinical, neuroimaging and NPE data it could be suggested that orbitofrontal cortex, dorsolateral prefrontal cortex and anterior cingulate gyrus dysfunction may be involved in violent behavior (14). The computerized NPE can provide additional information on cognitive components such as executive function and behavioral control that can be helpful for prediction of future dangerous behavior.

Tasks in NPE were developed to simulate real-life decision-making processes and may help in characterizing target specific putative cognitive-behavioral mechanisms. It is essential to obtain valid estimates of neuropsychological performance in the characterization of neurocognitive functioning in different types of offenders. At present NPE is starting a new phase of introducing the recently accumulated information and technologies resulting from research. Tomas Grisso in his address before the Psychological Expertise and Criminal Justice Joint Conference of the American Psychological and the Bar Associations noted: “We must try to introduce our new methods to courts, attorneys and clinicians in ways that minimize that threat and maximize their promise. That is an effort that is most likely to be successful if lawyers and psychologists accomplish it together.” (15)

Real-Time Computerized Testing vs. Traditional Neuropsychological Examination

Conventional neuropsychological “pen-and-paper”

tests remain popular because of their relative ease of administration and due to the existence of well-established normative data. Their limitations are related to the time-consuming complexity of administration and scoring, and to vulnerability of data-handling methods. “Pen-and-paper” tests take several hours to administer and require a well-trained, qualified neuropsychologist (16). Data entry is manual with inherent necessity for costly procedures to eliminate errors. An additional limitation includes a poor temporal resolution (“pen-and-paper” tests do not record precisely the time-accuracy tradeoff during task performance, as well as undocumented changes during real-time performance). One of the difficulties with “pen-and-paper” tests is the separation of speed and accuracy, two important features of performance that have been shown to be associated with different regional brain activation (17). NPE’s aim is to measure highly specific cognitive functions. However, it is difficult to separate completely the signal of one function from the noise of another in a specific test, thus, interpretation and explanation by an experienced clinician is still required. In order to overcome these shortcomings, computerized tests were developed to detect specific domains of neurobehavioral impairments. Such computerized tests should examine at least the following: speed of processing, attention (sustained, selective and divided), working memory, learning and memory, reasoning and problem solving. It may also be integrated into intellectual, executive (e.g., impulse control), attention, memory (short and long term) and sensorimotor domains (18–20).

The technological advances of the last 10 years have allowed psychiatry to consider the use of computerized NPE, which utilizes much better temporal resolution than traditional pen-and-paper tests. Computerized NPE is able to assess accuracy and reaction time separately. A synthesis of these results in speed-accuracy tradeoff analysis may help build a more detailed model of individual cognitive functioning. Traditional neuropsychological tests are aimed at broadly defined domains of clinical relevance, while the computerized NPE tasks are narrowly defined to activate specific brain circuits (16).

An expert is a person who possesses knowledge, skills, experience, training, or education, and may give opinion testimony in his area of expertise (21).

Testimony of neuropsychologists should be readily understood by those partaking in the court procedure and who are not specialists in this field (such as judges, prosecutors, lawyers). For this purpose the description of the cognitive processes in terms of the elementary neurobehavioral characteristics (as a result of real-time examination), such as speed and accuracy, is clear and well defined. Computerized NPE provides quantitative data which characterize performance and were collected in a non-biased and uniform standard assessment procedure. The NPE description of such real-time elementary behavioral parameters is acceptable to the courts as admissible evidence under cross-examination. In court situations there is a common problem with interpretation of psychological tests in the context of the court procedure (22). Computerized NPE quantitative results are relatively simple and easy to understand. In addition, the use of computerized NPE attenuates possible examinee-related distortions, which may sway the results. The computerized NPE is able to record and document a single behavioral act in real-time processing. It also makes it possible to detect in a real-time regime any performance manipulation of the examinee. Therefore, it can be used not only to analyze the final results, but also to monitor closely the sequence of single acts during the assessment procedure.

Neuropsychological evaluation in a forensic setting

The NPE in forensic (criminal) psychiatry practice focuses on: (i) competency to stand trial, (ii) mental state at the time of the offense, (iii) risk for future violence, and (iv) malingering issues.

Competency to stand trial

Competency to stand trial is the evaluation of the defendant's mental state at the time of trial. In the U.S., forensic practice has demonstrated that the legal issue of competency to stand trial is introduced in approximately 5–7.5% of all cases (22) and in 46–50% of these cases forensic psychologists added the NPE to their pretrial evaluations (23). About 16% of defendants after NPE were deemed incompetent to stand trial as a result of psychiatric pretrial evaluation (24). The presence of identifiable brain lesions

(rather than psychopathological symptoms) was the single most significant factor predicting the incompetence to stand trial: 100% of the defendants with organic brain disorder were judged incompetent to stand trial versus only 60% of the defendants with other DSM-IV diagnoses (24).

Psychological testing and NPE are usually performed in cases of subtle brain dysfunction. NPE helps bring together the defendant's cognitive strengths and weaknesses as they relate to issues of specific cognitive deficits that may affect competency to stand trial. Because competency is a contextual issue, using NPE may add information about the defendant's level of understanding and reasoning ability in the context of a legal situation (judgement).

In clinical settings the neuropsychologist has the responsibility of referring to the actual needs of the patient. The patient is the one initiating the examination because he seeks help (e.g., treatment). In such situations patients rarely exaggerate or fabricate symptoms. In contrast, in forensic situations the examinee is aware that the neuropsychologist is acting as a third party and the results of NPE may be contrary to the examinee's interests (25, 26). Therefore, the interaction between neuropsychologists and examinee is different as is his/her motivation during NPE. Computerized NPE may help to document influences of motivation factors on performance, by real-time data recording.

Mental state at the time of the offense

Computerized NPE may help evaluate diminished inhibition capacity (impulse control) resulting from an impairment (27). Every crime contains conscious intent (*mens rea*) and physical conduct (*actus reus*). Such "organic" factors as intoxication, use of medication, and neurological conditions may influence the mental state of defendants and may decrease the level of intent (28). Diminished capacity raises the issue of automatism, which refers to criminal behavior that is executed unconsciously and without intent.

The issue of automatism is critical for legal responsibility. True automatism is always caused by a neurological defect. This defect may be "structural" (e.g., epilepsy, brain trauma), or alcohol and drug intoxication (a state of "drunken automatism" [28]). "Insane" automatism refers to a crime that originates

from structural brain dysfunction (29), such as crimes committed during a seizure, during unawareness secondary to head injury or due to other encephalopathic conditions (30). Such expert conclusions may lead to a “not guilty by reason of insanity” verdict. McSherry (31) showed that decisions on the issue of automatism are extremely subjective and dependent on arbitrary judgements made by expert witnesses. Clinical judgement depends on what a forensic expert is willing to consider as “structural brain dysfunction.” The NPE, on the other hand, may detect and document behavioral dysfunction of structural brain impairments and these results can help understand the role of organic factors in differential diagnosis.

Malingering

In forensic settings the use of formal NPE of malingering and/or aggravation, with the tasks designed for this purpose, is critical (21, 32, 33). Malingering has been defined as the “intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives” (34). A survey of the American Board of Clinical Neuropsychology membership reported 33,531 annual cases involved in personal injury, disability, criminal, or medical matters. Of those, 29% of personal injury, 30% of disability, 19% of criminal, and 8% of medical cases involved probable malingering and symptom exaggeration. Thirty-nine percent of mild head injury claims resulted in diagnostic impressions of probable malingering. Base rates did not differ among geographic regions or practice settings, but were related to the proportion of plaintiff versus defense referrals (35).

Recent introduction of computerized procedures of data collection have improved cost-effectiveness of NPE and are widely used in legal and administrative settings (36). In those settings NPE has three general approaches to assessment of malingering: (a) symptom validity measures, (b) invalid patterns of performance on clinical neuropsychological measures (performance inconsistency), and (c) concomitant extra-test behavioral information or observations (inconsistency between performance and clinical observation). In each case some aspect of behavior is compared to an external standard or to other intra-subject behavior. Inconsistencies and

discrepant comparisons are cause for validity concerns. In some clinical situations the most that can be said about an invalid performance is that it is not indicative of the true neurobehavioral capabilities of the person being evaluated, and is not consistent with the presumed etiologic event (37). A prospective way of detecting malingering may be using NPE for monitoring of day-to-day function on performance and identification of inconsistency in cognitive functioning (38). In general, malingerers usually overestimate the cognitive impairments associated with disease and perform more poorly on NPE than real patients (39). Documentation of malingering by the use of computerized NPE helps identify more effectively a “specific malingering pattern” and/or performance, which was significantly below what would be expected by chance (38). For example, at NPE, the examinee is performing various tasks with different levels of difficulty. According to the escalating amounts of information, the healthy person will answer correctly, but at the expense of response time, which will decrease. A sick person will reduce both the accuracy and speed of performance, and a malingerer will perform inconsistently, without concordance with task level of difficulty (40). It was suggested that malingerers usually receive lower scores on the NPE tasks than would be received by random answers; however, this assumption is under debate (38).

Some clinicians, who may have difficulties in recognizing unusual behavioral manifestation of the psychopathological symptoms, have a tendency to classify such behavior as malingering. They forget that aggravation in forensic situations is not a psychiatric diagnosis, but only one of many possible behavioral patterns of patients under psychiatric evaluation. Even when aggravation/malingering are decidedly suspected, this observation by itself does not preclude the existence of a real psychiatric disorder. It should be emphasized that exaggeration or noticeable intensification of the previously (rather than currently) existing symptoms is not identical to purposeful voluntary falsification or fabrication of symptoms. In NPE, the detection of attempts to fabricate impaired cognitive functioning does not automatically exclude the presence of a psychiatric disorder. Thus, in a forensic setting, even obvious malingering of cognitive impairment with clear doc-

umentation of intentionally produced distortions of neuropsychological performance should be interpreted with caution, in order to avoid an erroneous conclusion of absence of psychopathology (40). The problems associated with different motivation in forensic situations are a focus of recent debates and official position statements (41).

Prediction of Future Dangerousness

In the U.S.A., before a death penalty is handed down the psychiatric prediction of future dangerousness is taken into consideration (42). The official position of the APA is that neither psychologists nor psychiatrists have any special abilities to predict future dangerousness (42, 43). Despite this, psychiatrists are frequently called upon by the legal system for just such services, as experts on dangerousness issues. Actually, the best predictor for future dangerousness is past criminal behavior. Researchers have identified important risk factors (44) and have developed integrative risk-assessment measures with predictive validities that are significantly greater than chance (45). A standardized risk assessment instrument would be useful as a predictor of future dangerousness (46).

Damage to the prefrontal cortex and temporal lobes or to the frontal-subcortical system in white matter ischemia or diffuse axonal shearing can cause a behavioral disinhibition syndrome, often termed "pseudopsychopathic," or "acquired sociopathy" that can surface as a combination of jocularity, impulsive and dangerous behavior, and sexual disinhibition (47–49). In such situations forensic NPE is usually required to assess the risk of future violence.

Neuropsychological examination in the court

NPE provides a standardized, quantitative examination of cognitive functioning, and characterizes specific cognitive impairments that may reflect a brain dysfunction (50, 51). For lawyers, the NPE-based data rather than clinical interviews are appealing, thus approximately 30% of referrals for NPE come from lawyers (52).

The decision of the U.S. Supreme Court in 1993 in *Daubert v. Merrill-Dow Pharmaceuticals* (1993) has established a new threshold for admission of in-

formation from experts by incorporating hypothesis testing (testability), having a known error rate, and having been subjected to peer-review in the publication process (53). In light of the "Daubert test," the NPE has an established scientific base of knowledge, of standards for clinical competence, and of evidence of peer-reviewed acceptance by medical related disciplines. NPE, like other scientific disciplines, has employed a rigorous methodology for assessing cognitive function and disentangling the relative contribution of brain dysfunction and psychological factors from the presentation of symptomatology (54).

It is noteworthy that in the case of *John vs Im* (2002) the NPE was done by a licensed psychologist rather than by a medical doctor and the Supreme Court of Virginia did not qualify this NPE as expert medical opinion regarding the cause of brain injury (55). Concerning the situation in Israel, Prof. Amnon Carmi (former Judge) emphasizes that "NPE may play a role in legal (court) procedure by being only part of the documentation, on which the psychiatric testimony is based, but not as independent evidence, and not to assess the psychological characteristics of the offender, his trustfulness or his competency to stand trial and bear criminal responsibility." Nevertheless, Prof. Carmi also suggests that the experience of other countries in using NPE in legal procedures should be carefully studied before it is adopted in Israel (personal communication, 15.09.2005). We are not aware of any case where NPE was admitted as independent evidence by the court in Israel. We suggest that in the future NPE should be included as a legitimate and pertinent part of neuropsychiatric examination provided to the courts.

Summary

NPE is particularly useful in detecting subtle cognitive dysfunction and monitoring its changes over time. It is widely used in forensic situations for patients with suspected cognitive impairment, since it can help detect and document different modes of malingering and of cognitive impairments in forensic settings and civil tort claims. The real-time computerized neuropsychological assessment is a highly sensitive, well standardized measure of specific cog-

nitive abilities and may become the next step toward development of a standard uniform testing procedure. Further utilization of real-time computerized tools in forensic psychiatric practice could improve significantly the quality of NPE and will eventually lead to its adoption as independent evidence-based testimony in the context of the court (legal) procedure.

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