NEUROPSYCHOLOGY
AND
THE NEUROPSYCHOLOGIST:

Understanding and Using Neuropsychological Information

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INTRODUCTION:

My oral presentation today is intended to focus very specifically on critical issues regarding the limits of neuropsychology, and what it can (and cannot) contribute to the efforts to litigate and defend claims of mold-induced neuropsychological damages. The following pages consist of materials which I have put together for previous Mealy's presentations which attempt to provide a more general framework for non psychologists who use neuropsychology in their work. It is not intended to be a guide to this presentation, but rather as a general reference on the subject of neuropsychology. SA

NEUROPSYCHOLOGY:
Neuropsychology is a well recognized, but much misunderstood specialty area within psychology. It has it's own certifying boards (just like in medicine) and specific requirements for use of the title. Neuropsychologists are Ph.D. level psychologists who have accomplished extra training in the specialty of Neuropsychology. Such training provides the neuropsychologist with the knowledge and skills to perform a number of additional functions for which the Clinical Psychologist has not been trained.

A Neuropsychologist is **NOT** defined as a person who "gives" neuropsychological tests; at least half of practicing neuropsychologists (including Ralph Reitan who is considered by many to be the "father" of modern neuropsychology) have much of the testing administered by a trained technician. A Neuropsychological Evaluation is **NOT** comprised of a list of scores interpreted in isolation. Rather, the Neuropsychological Evaluation is the integrative interpretation of a variety of discrete bits of data in a manner which enables us to assess the integrity of the brain and central nervous system and to relate these findings to real life activities. In a Clinical setting, the evaluation should enable us to direct, identify, and (in some cases) carry out interventions which may be helpful in overcoming deficits.

It is within the purview of the Neuropsychologist to describe a cause or causes for an identified deficit; this is a question the practicing clinician is repeatedly asked by patients, parents and other professionals. Additionally, understanding causation enables us to form better prognoses and to plan more efficient interventions.

As defined by the National Academy, Neuropsychology is:

> "The study of brain behavior relationships based upon
> A combination of knowledge from basic neuroscience,
> functional neuroanatomy, neuropathology, clinical neurology
> psychopathology, and psychological interventions."

Within Neuropsychology, there is a subspecialty, Developmental Neuropsychology, which might best be described as "all of the above with special attention to the impact of physiological and cognitive developmental factors as they impact on brain behavior relationships in infants, children and adolescents and adults." The Developmental Neuropsychologist acknowledges that the human brain is an evolving organ which is changed both by experience and by it's own DNA based developmental program. Within this context, the Developmental Neuropsychologist is able to make reasonable predictions about recovery from acquired neurological illness or injury during various phases of the lifecycle, and to describe the natural history of a developmental disorder.

TEST CONSTRUCTION:

In the clinical setting, this study of brain behavior relationships focuses on specific behaviors which have been quantified in various neuropsychological and psychological tests. In some ways, the neuropsychological evaluation can be thought of as a highly structured interview in which the universe of correct responses is clearly delineated. The quantification (otherwise known as standardization) consists of administering the test items to very large samples felt to be

an adequate reflection of a larger population. By using the "normal curve", a construct which places individuals with reference to other individuals in a sample, we are able to derive numbers which tell us how well a particular skill or set of skills is functioning when compared to the "norm" or numerical average of the sample group. Through a variety of statistical manipulations, we turn these comparisons into standard scores, which are a shorthand way of describing an individual's location on the normal curve. People whose performance deviates too far in a negative direction from the mean are felt to exhibit deficits. Those whose scores fall well above the mean are felt to have exceptional abilities.
In psychological and neuropsychological test construction, the normative sample is usually comprised of presumed "normals" so that the mean is truly representative of a reasonable expectation for individuals within that population. Occasionally tests are intentionally normed on special populations. In this situation, a person's scores are compared to those of people with known impairments to determine if the performance mirrors that seen in the special population.

QUESTIONS OF CAUSATION:

In science, the best way to support a causation hypothesis is by creating an experimental design in which the examiner manipulates a particular variable to change the outcome. In theory, all or most of those subjects who have been so manipulated will have a particular outcome while most or all of the others will not. Even within these carefully controlled designs, there remains the possibility that the outcome was not related to the manipulation. Recognizing this, scientists compute an estimate of how likely it is that the result were obtained "by chance." This estimate is the "P" value. A P of .05 means there is a five percent possibility the results were obtained in error; P of .01 means there is a one percent chance that the findings occurred by accident. When scientists say that something is "significant" at a particular level, they simply are estimating how likely it is that their results are wrong. By convention, scientists have accepted an error rate of .05% as an adequate safeguard against erroneous results. Statistical computations allow us to identify different "P" values, but one is not considered more "significant" than others.

Supporting causal hypotheses in human subjects is somewhat more difficult, as we cannot simply subject people to a manipulation (especially a dangerous one) and then measure the outcome. Consequently, we often lack good experimental studies which allow us to generate causal hypotheses about individuals.

Lacking the ability to create experiments which directly assess causality, scientists, especially those concerned with health issues, often turn to correlational research. Such research allows us to identify an **Association** between factors, but this is quite different from establishing a causal relationship. Indeed, every first year Graduate student in science is taught the maxim, "Causation does not imply Causality." A correlation merely demonstrates that as one factor varies, so does another. In a positive correlation, as Factor A increases, so does factor B. In a Negative Correlation, as Factor A increases, Factor B decreases. In dealing with correlational findings one must also consider the effect of confounders or covariates, other factors which occur in association with the hypothesized cause and which actually account for the relationship.

In the third factor problem, we have some unidentified third factor separately responsible for both the presumed causal factor and the outcome variable. For example, there is a statistical association, a good correlation, between ice cream consumption and street crime. As ice cream consumption increases, so does street crime. Seeing this association, one might be drawn to the improbable conclusion that ice cream consumption causes street crime. It turns out however that both ice cream consumption and street crime are tied to a third factor, warm weather. As the temperature increases, so does ice cream consumption and street crime. There are separate and independent relationships between warm weather and ice cream consumption and between warm weather and street crime, but no real relationship between ice cream and street crime. We call this a “spurious” correlation.

At other times, associations are the result of a “path” of relationship in which factor A requires the presence of factor B in order to be associated with Outcome C. If we look only at the latter part of the path, it appears that the association is between factor B and Outcome C, when in fact factor B is only necessary for factor A to exert it’s effect. factor B, by itself, has no relationship to outcome C. This kind of factor is called catalysts. They are required for a reaction to take place, but can not cause any reaction. At other times two factors, A and B usually occur together. While factor B has no direct relationship with outcome C, factor A does. If we don’t consider factor A, we mistakenly assume the relationship is between B and C.

Like the findings of true experiments, correlations or “r’s” are assigned significance levels which have exactly the same meaning as they do in experimental hypothesis testing. However, in correlational studies, especially large ones which sample more than a couple of data points, there is also an error rate associated with the number of discrete computations performed on the same set of data. Consequently while it may only be 5% likely that a particular result occurred by chance it may also be that within the entire set of analyses, there is a 20% chance, that any one statistically significant individual comparison is in error.

This accounts in part for the fact that in many topic areas, there are articles which appear to support contradictory hypotheses. One way in which scientists can make some sense of all the conflicting reports is to perform a statistical analysis called a “Meta Analysis.” Meta Analysis statistically combines the results of many studies, describes the most consistent effect, and assigns a P value to that finding. Reliance on Meta analyses (especially when there is more than one and the findings are consistent across numerous such analyses) reduces the likelihood that we will rely on a study or set of studies which do not actually represent the most scientifically defensible conclusion.

Another way to look at issues of causation in human populations is to seek a “naturally occurring experiment”. If for example, a particular outcome is seen **ONLY** in the presence of a particular factor, then it is reasonable to assume that the factor is either a “cause” of the outcome, or a “marker” for the cause. Likewise, if a particular factor **Always or Nearly Always** results in a particular outcome, it is reasonable to assume that the outcome is caused by the factor or by something for which it is a marker.

When a neuropsychologist attempts to establish an etiology for a neurocognitive outcome in a particular individual, he first considers, based upon available information, what factor or factors constitute a reasonable explanation for the outcome. To do this he looks to his training, and experience, or to a variety of forms of published literature. Some of the causes will be “background” causes, unrelated to any specific event. When considering background causes, the

Neuropsychologist generally weights these in terms of their strength relative to a given patient, and generates some hypothesis about which of these possible causes are likely to have been involved. At other times, the neuropsychologist will be faced with a discrete episode which can be fixed in time, and which is a potential causal agent. Often causes of both types are relevant.

As in general science, the best method for establishing causation in a specific individual is to look at the “experiment” which fate has created. We have a person at point A functioning in a specific way, an intervening “event”, and his functioning at point B after the event. If functioning at point B is markedly different than at point A, and if there have been no other intervening variables which may have caused the change, it may be reasonable to presume that the event is “causally” related to the change in functioning.

In adults and adolescents and older children, we frequently have a large pool of data upon which we can base an estimate of “premorbid functioning.” Typically we have school records, medical records, and vocational records, and in some situations we actually have standardized test data which is highly correlated with the measurements we are now making. We can compare present data with prior data and conclude that the intervening event was more or less likely causally responsible for the outcome we measure.

Example:

Subject: A 19-year-old college sophomore is involved in an MVA in which he suffers a moderate to severe closed head injury with Coma for two weeks. He is evaluated one year after the accident and is found to have an IQ of 85 with disabilities in math and spatial organizational skills.

Premorbid History: Patient attended MIT where he majored in Software Development. He has a 3.75 GPA. GPA for most recent semester was 3.8. SATS were 690 Verbal; 720 Math. Otis Lennon School Abilities Test (Similar to an IQ Test) in grade 7 was 115 Verbal and 145 Non Verbal. Most recent Achievement Testing noted Reading and Math in the 99th Percentile. Medical record reveals no other neurologically significant event between the premorbid measurements and the MVA.

Post Morbid Test Findings:
Verbal IQ 90; Performance 80; Full Scale 85
Reading Tests: Vocabulary 105; Comprehension 90
Math Tests: Reasoning 65; Computation 75
Attention: Poor
Tolerance for frustration: Poor
Verbal Memory 70; Visual Memory 65
These Findings are inconsistent with premorbid data.

In this example, it is very reasonable to assume that the Closed Head Injury received in the MVA is causally related to the loss of IQ points, diminution in Math and Spatial Skills, some loss of Reading Ability, Loss of Verbal Reasoning Skills, and impairment in systems controlling

Attention and Inhibition. While most cases are usually more complex, the basic analysis is the same.

By contrast, when we assess children who are alleged to have sustained a CNS injury prior to the collection of such data, and well prior to the present neuropsychological evaluation, it is much harder to estimate premorbid functioning. Sometimes there will be particularly good medical records which carefully track development, however these are more likely to helpful in documenting premorbid dysfunction than normal development. Consequently, statements about causality can be advanced only with the utmost caution, and only after carefully considering all of the likely other hypotheses generated by the history and the record.

THE NEUROPSYHOLOGICAL EVALUATION:

Science rests upon two basic principles: Validity and Reliability. Simply put, Validity measures how well something tests or measures what it purports to test or measure, and reliability refers to the reproducibility of the results by someone else using the same techniques. Validity and Reliability are the cornerstones of good science and need to be considered when evaluating any piece of scientific work.

Neuropsychological Evaluation consists of the administration of a large number of tests, the taking of a large number of measurements, the integration of this with historical information and the interpretation of this in the context of our knowledge of brain function. The principles of validity and reliability can be applied, in broad terms to every aspect of the Neuropsychological Evaluation process, from the credentials of the Neuropsychologist to the research support for the conclusions.

The responsibilities of Neuropsychologists in conducting evaluations and in representing themselves to the public are clearly spelled out in the American Psychological Association Ethical Guidelines and Code of Conduct, APA Standards for Educational and Psychological Testing; State Boards of Psychology Ethical Guidelines; and State Licensing Laws.

For a neuropsychological evaluation to be valid and reliable, it should meet, at a minimum, the following standards:

1. Professional Competence: Is the individual conducting the examination qualified to do so?

2. Technical Competence: Are the measures correctly administered and scored; are the instruments themselves valid and reliable; are appropriate areas of function measured?

3. Theoretical Adequacy: Is the scientific knowledge base sufficient to support the findings and conclusions in the report?

4. Historical Adequacy: Has enough background information been collected from sufficiently reliable sources to support the conclusions and opinions and to rule out alternative explanations?

PROFESSSIONAL COMPETENCE:

Like physicians, psychologists are generically licensed by the State in which they practice, regardless of any specialty training they may have taken. Consequently, many clinical psychologists "proclaim" themselves to be neuropsychologists capable of administering and interpreting neuropsychological tests simply because there is nothing in state statues which specifically prohibits them from doing so.

In assessing the professional competence of someone who holds himself out to be a neuropsychologist, one can consider the following factors:

1. Credentials
2. Training
3. Experience
4. Scope of Practice

Credentials and Training:

1. The minimum credential for qualification for practice as a psychologist is licensure by the appropriate body in the state in which the individual bases his practice.

2. In addition to satisfying the requirements for the Ph.D. in psychology, the clinical neuropsychologist is expected to have specific coursework and supervised experience in neuropsychological evaluation.
3. The American Psychological Association, in conjunction with the National Academy of Neuropsychology, the American Medical Association, the American Psychiatric Association, and the Health Care Financing Administration have identified two levels of definition by which an individual can claim to be a neuropsychologist.

4. To be eligible at Level I, the individual must be certified by examination by either the American Board of Clinical Neuropsychology (ABCN) or the American Board of Professional Neuropsychology (ABPN).

5. To be eligible at Level II an individual must at the minimum:
    - Have a doctoral degree in psychology from a regionally accredited institution
    - A Minimum of three years of experience of clinical neuropsychological experience at either the pre or postdoctoral level
    - Two years clinical supervision consisting of two years predoctoral supervision; one year protectoral and one-year postdoctoral supervision; or successful completion of a postdoctoral fellowship.
    - License at the level of independent practice
    - Clinical neuropsychology is defined according to NAN definitions.

6. Essentially, people who can claim the title at Level II are usually eligible to sit for either of the two sanctioned boards. Specific information on qualifications for the ABPN and ABCN Boards follow. The two Boards differ essentially only in the nature of the written

examination. ABCN uses a multiple-choice exam while ABPN prefers an Essay Exam. Both Boards require oral examinations.

7. Individuals who hold themselves out as developmental or pediatric neuropsychologists should have documented coursework and supervised experience in the evaluation and testing of children and adolescents. Even within this group, very few neuropsychologists (or clinical psychologists) have significant experience with children ages five and under.

8. Neuropsychologists who are prepared to make statements about causality which are based upon review of the relevant literature, need to have the research training which would enable them to do so. Not all "Drs." are created equal. Individuals with Psy.D. or Ed.D. degrees may not have completed the requisite training in research methodology which would enable them to evaluate the literature Such training is typically accomplished by:

   - Completion of a research dissertation (as contrasted with a clinical case study)
   - Specific coursework in research design in analysis with training at the postgraduate level
   - Publication of at least one independent research project in a peer reviewed journal.

Experience and Scope of Practice:

1. A neuropsychologist who claims expertise with a special population (e.g. children, the aging) should have or have had regular **clinical** experience with that population. Experience should not derive solely from that gained in a forensic context. Many neuropsychologists, especially those with mature careers, may specialize with a particular group or referral question; if the lifetime career clinical history demonstrates experience with broader populations, there should be no questions as to competence.

2. Most neuropsychologists restrict their practice to testing and/or neurorehabilitation. By contrast, clinical psychologists perform a variety of different functions including counseling, psychotherapy, and testing. When a neuropsychologist also practices as a generalist, it is important to define the amount of time s/he actually spends ding neuropsychological evaluations. Most practicing neuropsychologists would agree that something on the order of 50 evaluations per year would be the minimum to maintain competency. Obviously individuals working with special populations should have a minimum of 50 evaluations per year with the special population in question.

TECHNICAL ADEQUACY:

1. Appropriateness of Instruments/ Appropriate Use of Instruments:

Many individuals who lack adequate training and experience in neuropsychology often "give away" their lack of expertise in their selection of instruments. Specific problems include the use of out of date instruments (a violation of APA Ethics and Testing Standards) or statements that there are NO instruments for a particular age group. Individuals who do not do a lot of testing are frequently unaware of revisions and new instruments. Further, because tests are expensive (up to $1000 per instrument where computer administration or scoring is available), individuals who use them infrequently may be unwilling to undertake the expenditure required to maintain a current library.

Use of tests in populations for which they have not been normed is another serious concern. Typically, good instruments are standardized on large samples of individuals who typify the population for which the test is intended. Tests may have limited validity in individuals who are bilingual or bi cultural, or who lack the presumed experiential base of the instrument. Typically, this is referred to as "Cultural Bias." Merely translating a test into another language does not overcome this lack of validity in bilingual populations. The American Psychological Association makes a very clear statement in its Ethics and Standards that, where testing may be of limited validity, the examiner must note this and take it into consideration when interpreting the results. Indeed this problem can be so severe that Alan Kaufman, author of the WISC-III, has advised against computing a Verbal IQ in Bilingual Spanish speaking youngsters and urges caution when interpreting Verbal test data derived from African Americans.

Neuropsychologically unsophisticated examiners may use canned or "fixed" batteries of tests about which they know very little. Frequently such examiners will get a computer generated report which identifies a deficit or deficits, but are unable to explain how the specific pattern results lead to that conclusion. Such examiners are frequently unaware of the weaknesses or drawbacks of their instruments. They may for example, give only a part of an instrument but then draw a conclusion which actually can only be drawn from the entire instrument (e.g. diagnosing Mental Retardation based upon a low score on the WISC-III Vocabulary subtest, or diagnosing "brain damage" from performance on one or two subtests of the Halstead-Reitan Battery.)

2. Adherence to Standardized Procedures:

Tests are designed to be administered in a standardized fashion to insure reliability. While it is permissible to deviate from standard procedures for "limit testing" or "optimization," such data must be clearly identified and reported in addition to, not instead of, that which is obtained under standard conditions.

When deviation occurs because of physical or sensory handicaps, the alternate procedures must be clearly identified and the interpretation must consider both the use of such procedures and any additional effects of the handicap which are not compensated.

3. Scoring Errors:

Neuropsychological Evaluation entails the collection of literally hundreds of individual data points and many many discrete computations. All neuropsychologists make mistakes, and usually these do not significantly affect the outcome. Mistakes which can have major consequences include errors in age computations and use of the wrong tables in the manual. Neuropsychologists have a responsibility to make their data as error free as possible. Use of computerized scoring programs has reduced, but not eliminated, scoring errors as the programs require the input numbers to be correct.

In litigation contexts, attorneys often request that they be provided with copies of the test protocols or "raw data." It is the neuropsychologist's ethical responsibility to refuse and resist such release to non-psychologists; this area is discussed in some detail in the Ethical Principles, Standards and additional documents. There is however, absolutely NO restriction on the release of such data to other psychologists. In point of fact, the raw data makes little sense to anyone but another psychologist; it certainly requires psychological training to be able to assess the protocol for scoring and other errors.

4. Factual Errors:

Sometimes errors will occur in the reporting of factual material such as age, grade in school, medical history, etc. While one or two such errors are not deadly, the neuropsychologist has an ethical responsibility to report factual material correctly. When he demonstrates a consistent pattern of errors in factual material, it calls into question the reliability of the remainder of the evaluation. Where conflicting historical information is provided, it should be noted as such.

5. Validity and Reliability of Instruments.

All instruments used should include technical manuals which identify validity and reliability coefficients. When instruments lack such information, it is inappropriate to present the findings as standard scores without noting the technical limitations of the instrument.

6. Adequate Sample of Relevant Behaviors.

A neuropsychological evaluation should evaluate functioning in at least the following areas and relate the findings to daily functioning:

- Intelligence
- Verbal Reasoning
- Language Development
- Visual Spatial Skills
- Non Verbal Reasoning
- Academic Skills
- Complete Memory functions by Channel
- Complete Attentional Functions by Channel
- Auditory Processing
- Visual Processing
- Problem Solving, Planning and Flexibility
- Motor and Sensory functioning (optional)
- Personality Functioning (optional)

Finally, the neuropsychological examination should include an assessment of the relevant non-cognitive factors, including cooperation and motivation, which may affect the findings. This is especially important in forensic contexts in which individuals may not always be motivated to perform their best. While conscious "malingering" is not often a problem with school aged children, they may not be motivated sufficiently well to participate actively with the process.

In older adolescents and adults, motivation can be measured with the use of specially designed instruments. In children, motivation can be assessed clinically, and by the use of probing questions to determine what they have been told about the testing. Assessment of motivation is critically important for plaintiffs as well as defense neuropsychologists as it is difficult to defend data which are demonstrated to be derived from incompletely compliant patients.

7. Adequate Format:
The Neuropsychological report should be structured in a manner which clearly identifies the patient and relevant demographic data, instruments used, and the referral source and question. Forensic evaluations should be specifically identified as such. The body of the report should clearly delineate the areas of function sampled, provide relevant scores and interpretations, and take care to separate observational data from psychometric data.

8. DSM Diagnostic Formulation Statement:
While not "required" by any authoritative body, the DSM Diagnostic Formulation Statement is the clearest and easiest way to identify the formal diagnoses which derive from the evaluation. The concept of diagnosis is especially important in neuropsychology as it enables one to discriminate between minor "difficulties" which do not interfere with "social, educational or occupational functioning" from true "disorders" which do rise to this level. Virtually all brains have some areas of mild or even significant deficit, however not all of these deficits actually have any impact in real life. Because of the number of brain functions and areas sampled, it is important that inconsequential variations be clearly separated from those which have significant impact.

ADEQUACY OF HISTORY:

1. Inclusion of Complete History:
The taking of a history is considered to be essential to the neuropsychological examination. Such history must include medical, social, educational, vocational and family information which will enable the neuropsychologist to put findings within a context. Without such information the data may be uninterruptible. This is especially important in the Forensic examination where often the neuropsychologist is asked to opine regarding causality. History also provides the neuropsychologist with information regarding possible areas of strengths and weakness to explore, and provides some direction to diagnostic considerations.

2. Objective (Primary Source) Verification:
In the clinical environment, it is usually assumed that the individual providing the history, (the patient or the parent) is motivated to provide the most complete and accurate information. Neuropsychologists well trained in history taking can usually elicit fairly detailed and accurate information through careful and structured questioning.

Individuals involved in litigation may have a lower level of motivation to accurately recall prior events. Often history is colored not by intentional distortion or misinformation, but by a "Litigation Factor" which suggests that persons involved in litigation may actually perceive and recall information differently than those in non litigation contexts. Consequently, it is very important that the forensic neuropsychologist attempt to gather as much objective history as possible through review of relevant records. These might include: medical records, employment records, educational records, Department of Social Service records, etc. Careful review of records often allows for the construction of an objective history which can be used to verify and/or supplement information collected during interview.

THEORETICAL/SCIENTIFIC ADEQUACY:

1. Research Support For Interpretations and Opinions/Misrepresentation of Research Findings:

As noted earlier, neuropsychologists must often rely upon the scientific literature to make decisions, especially as regards causation. Such research must meet certain standards, especially those pertaining to reliability and relevance. Simply citing to "the literature" or conventional wisdom is not enough. The neuropsychologist should be prepared to defend his conclusions by citing to specific articles and authors which appear in peer reviewed journals. At any given time, the scientific literature may contain very different conclusions among various authors, or even different findings over time by a single author or laboratory. Often, the overall research reflects certain consensus opinions about which most authors agree. It is these consensus findings that provide the best and strongest scientific basis, but these must reflect the research, not simply common belief.

2. Current State of Scientific Knowledge

Science evolves rapidly, and findings which once were state of the art (remember leeches?) often fall rapidly into disrepute. To form an opinion or conclusion, the neuropsychologist should rely upon current literature (certainly within the last five years, preferably within the last three).

3. Consideration of Alternative Explanations:

Before drawing a conclusion about experimental results, confirming an association, or assigning a causation explanation, the neuropsychologist has a responsibility to consider possible alternative explanations for his findings. An individual's neuropsychological profile is affected by a tremendous number of factors. Along the most important are:

- Genes
- Environment
- Prior and Current Medical Conditions
- Education
- Socioeconomic Status
- Brain and central nervous system insults

In trying to arrive at a causation hypothesis, the neuropsychologist assesses and weigh the possible contributions of alternative explanations which individually or collectively may be far more important than the factor under consideration. Often they turn out to be confounders which are actually responsible for whatever association is observed.

SUMMARY:

The effective understanding and use of the neuropsychological evaluation requires attention to a number of factors specific to the evaluation, but also rests upon an appreciation of the scientific principles of validity and reliability as they apply to evaluation. Understanding statistical and experimental principles involved in hypothesis testing and test construction enables one to draw conclusions which are well grounded in science and which stand up to the rigors of careful examination.

Neuropsychologists are different from other psychologists and neuropsychological evaluation is a process quite different from the ordinary psychometric and personality examination conducted by the clinical psychologist. Neuropsychologists can be most easily identified by their Board Certification, secondarily by examining training and experience.

When properly conducted by qualified examiners, Neuropsychological evaluation can answer very specific questions regarding brain functioning. It can generate and support causal hypotheses which help guide intervention and treatment.

Neuropsychological testing is itself neutral. Even when interpreted by a qualified individual, test data cannot in isolation identify a “cause” for it own findings. Brain dysfunction varies widely in nature, and intensity. Specific dysfunctions can reflect breakdown at any number of places in a line of specific skills required for a complex behavior or activity. Individuals can demonstrate specific isolated deficits; a number of seemingly unrelated deficits; or more global deficits which affect groups of functions, or all brain functions, simultaneously. Especially where isolated, deficits on neuropsychological testing do not necessarily translate into impairments in real life functioning.

Etiology in individuals is best determined by comparison of pre and post incident performance in combination with other factors; where this is not possible causal hypotheses should be advanced cautiously and only after consideration of the potential role of all reasonable alternative explanations.

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