

The Relevance of Neuropsychological Data

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Neuropsychology has experienced unprecedented growth during the last decade. However, significant questions regarding the relevance of neuropsychological data have been raised. This article attempts to answer these questions by examining the history, purpose, approaches, and applications of neuropsychological data.

Relevance can be defined as suggesting a close and logical relationship as well as being important to the matter in question. The implication of this definition is that relevance is a combination of need and usefulness. Although these two concepts can be mutually exclusive, they should not be because exclusivity leads to limited relevance. Thus, *both* need and usefulness are needed to make something relevant.

In this case, the question of relevance is directed towards the field of clinical neuropsychology and the applicability of neuropsychological data to understanding human behavior. This paper will attempt to ascertain whether there is a need for such data and whether the data produced are of value. There are two main reasons for addressing this question. First, few specialties within psychology have enjoyed such unprecedented growth. Secondly, despite this growth, some critical attacks have been leveled toward the efficacy of clinical neuropsychology. Thus, it seems paradoxical that both growth and aggressive criticism have occurred simultaneously. There is a third, possibly more subtle, reason for addressing this question. Clinical

neuropsychology may represent the best effort to date within psychology to legitimize itself to the medical and scientific community, especially as it emphasizes the academic/clinician interface. However, such legitimacy will only occur after the relevance of the field has been established.

To address the question of relevance this article will:

1. define neuropsychology,
2. trace its historical development,
3. compare its approaches to other fields,
4. explain basic neuropsychological approaches,
5. describe neuropsychological data and their potential uses,
6. consider questions of relevance, and,
7. place relevance into perspective.

Defining Neuropsychology

According to Meier (1974) "Neuropsychology is the scientific study of brain-behavior relationship." This study can be further defined as either clinical or experimental (Horton, Wedding, and Phaz, 1981). The clinical approach focuses on the application of neuropsychological knowledge to the assessment and remediation of

neurological disorders. In contrast, the experimental approach focuses on theoretical rather than practical issues. Often the experimental approach uses non-human animals while, by definition, clinical neuropsychology emphasizes human brain function. Regardless of their differences, both are psychological approaches and therefore rely upon the scientific understanding of behavior.

A third and related subfield within neuropsychology is behavioral neurology. In contrast to clinical and experimental neuropsychology, behavioral neurology emphasizes an intuitive and qualitative approach to the understanding of brain-behavior relationships (Luria, 1973). Further, the focus of neurology (relative to neuropsychology) is less cognitive. Analyses of sensory and motor variables are more common than analyses of cognitive parameters. However, although behavioral neurology and experimental neuropsychology are important to clinical neuropsychology, this article will primarily focus on the clinical issues.

Overview of Historical Trends

Like Ebbinghaus's famous statement about psychology's long past but its short history, the same could be said to apply to clinical neuropsychology. Indeed, the earliest known attempt to localize behavior to the brain is dated approximately 3,000 B. C. (Walsh, 1978). The trend toward localization of function continued with Rene Descartes (1569-1650), Paul Broca (1824-1880), and Pierre Flourens (1794-1867).

However, neuropsychological

principles, as espoused today, have their roots linked to the present century. Notable contributors include Kurt Goldstein (1878-1965), Alexander Luria (1902-1977), and Karl Lashley (1890-1958). More recently, Ward Halstead, Roger Sperry, Arthur Benton, and Hans Teuber have provided the foundations for modern clinical neuropsychology.

Present-day clinical neuropsychology can best be understood by examining three major approaches. In Russia, the qualitative, case study approach was originally espoused by Alexander Luria. In the United States, the psychometric concepts of Ralph Reitan and Charles Golden have been the standard. In contrast, the British approach uses a combination of these two approaches. This latter orientation is used in the United States, in a variation, by Edith Kaplan and her colleagues in Boston. As for the present, numerous forces are shaping the field and thus no one approach has emerged as best. Too many unknowns and too many variables are present. As for the field, critical questions remain including such issues as specialization, credentialing, and, of course, accountability (Puente, 1989).

Comparison to Related Fields

As with any new development in science and health care, clinical neuropsychology combines aspects of many related fields both within and outside psychology.

Within Psychology

There are several specialty areas from which clinical neuropsychology draws substantially. From an academic perspective, physiological and

experimental psychology are but two of the major areas which serve as a foundation. Physiological psychology provides the foundation from which a biological perspective is derived; experimental psychology provides a foundation for the careful, empirical analyses of behavior. Other related areas, of course, provide additional substance for the field and these include, but are not limited to, developmental, cognitive, and social psychology. Individual differences, largely overlooked in neuropsychology, is becoming increasingly important as human diversity is understood.

From the more applied perspective, clinical neuropsychology is deeply rooted in clinical psychology. Both diagnostic and treatment approaches in neuropsychology rely heavily upon this specialty. Of additional interest is the field of health psychology. For example, Tarter, Van Thiel, and Edwards (1988) have recently published a book on the impact of disease on behavior entitled *Medical Neuropsychology*. Education and neuropsychology have combined to understand the complex results of disabilities. Another promising interface has been between the areas of vocational and rehabilitation psychology. In many head trauma cases, the question of functional residual capacity becomes the central focus.

Medical

Four areas within medicine have contributed to the development of clinical neuropsychology as a separate discipline. Neurology's emphasis on peripheral nervous system and interest in basic motor and sensory behavior has

left open questions associated with the understanding of cortically modulated cognitive behavior (e.g., intelligence). This situation eventually resulted in collaboration with neurosurgery with pre and post surgical assessments of patients' cognitive status. Although rehabilitation medicine has only been recently linked to neuropsychology, the recent focus on treatment and rehabilitation has yielded strong professional ties between the two specialties. Finally, psychiatry must be included because both psychiatry and neuropsychology share a common interest in abnormal behavior.

In summary, clinical neuropsychology is a composite discipline borrowing heavily from psychology and related fields. In doing so, it forges unusually strong ties to medical psychological health practices as well as between academic and clinical/applied psychology.

Basic Neuropsychological Approaches

Puente (1988) describes in greater detail three major approaches to gathering neuropsychological information. In the United States one of the approaches is used primarily in neurology and two others are used in neuropsychology. The case approach, as formulated by Luria, is typically used by neurologists with a behavioral orientation. This approach emphasizes lengthy and careful observation of the patient's behavior in response to a variety of relatively unstructured and unstandardized tasks.

In contrast, neuropsychology in North America has generally adhered to one of two major approaches. The psychometric tradition has yielded

numerous specific tests applicable to measuring brain function. This approach could further be subdivided into two orientations. One orientation uses fixed batteries; the other uses flexible ones. The fixed approach is based on the use of two relatively comprehensive neuropsychological batteries -- the Halstead-Reitan Neuropsychological Battery (Reitan and Wolfson, 1985) and the Luria-Nebraska Neuropsychological Battery (Golden, Hammeke, and Purisch, 1980). The fixed approach has numerous advantages (e.g., between subject comparison) but several disadvantages (e.g., it often lacks within subject sensitivity). The flexible approach, as espoused by Kaplan, seeks to remedy these disadvantages by tailoring the evaluation (and treatment?) to the specific problem in question as well as to the client. Further discussion and presentation of these topics is found in Incagnoli, Goldstein, and Golden (1986).

Regardless of the approach, all share a common denominator -- a goal of more accurate understanding of brain-behavior relationships in the clinical situation. To argue the differences among approaches seems at best academic. The emphasis is, and should remain, understanding behavior as it can be directly traced to brain disorder.

Neuropsychological Data and Its Application

An excellent place to begin in this section is to outline what neuropsychological data is *not*. First, and foremost, neuropsychological data is not information about localization. Modern neuroradiological measures (e.g., CT, MRI, PET) are often more

accurate. Further, psychologists are not in the business of localization (if that were possible) if for no other reason than that our training is not morphological; rather, it is behavioral.

Behavioral information about brain dysfunction can be of value in several situations. Primarily, it can provide information about individuals' residual capacity, whether the interest lies in understanding their strengths or their weaknesses. This is often the primary focus of the clinician attempting to understand a client's problem. An alternative focus is use of that information to help us understand a particular set of symptoms -- for example, schizophrenia. Such an approach is especially useful in research studies. Finally, data can be applied to placing the client in a context. An excellent application is that of vocational questions. The concern is whether clients can perform their original jobs or what residual capacities (if any) exists to perform any type of work. These and related questions often fall into the legal domain. In summary, behavioral data can be of use in understanding clinical, academic/research, or legal/forensic issues.

Questioning the Validity of Neuropsychological Data

There is little question that a considerable amount of money as well as personal outcomes hinge on many neuropsychological cases, especially if legal questions surface. Financially, the client could win (or lose) up to several hundred thousands of dollars. From a different perspective, such outcomes affect the insurance carrier losses.

Further, the company or individual purchasing such insurance may be faced with higher rates. Thus, the future of both individuals and organizations are intrinsically bound to be both directly and indirectly affected. Possibly due to the potential outcomes, forensic cases often deteriorate into adversarial battles.

In such adversarial situations, the importance and validity of neuropsychological data and testimony has assumed a critical role. Recently, Faust and colleagues (Faust, Guilmette, Hart, Arkes, Fishburne, and Davey, 1988) published a study examining the judgment accuracy of clinical neuropsychologists who were identified on the basis of a variety of criteria. They were selected from the memberships of the American Board of Professional Psychology, Division 40 of the American Psychological Association, and the National Register of Health Providers in Psychology. These individuals were then forwarded one of ten vignettes, eight of which described verified neurological deficits (e.g., Alzheimer's disease). The respondents were to review the case and answer several questions including location, progression, and type of dysfunction. Respondents were then asked to provide information regarding their training and expertise for professional practice.

Approximately 60% of the total of 155 records were used for the analyses. Results of the Faust et al. study indicated that "virtually no systematic relations were obtained among a series of training and experience variables and accuracy across a series of diagnostic judgments" (p. 159). These authors

further state that it is acceptable to conclude that "about one in three normal individuals are misdiagnosed as abnormal" (p. 160).

In a more recent review of the literature, Wedding and Faust (in press) addressed the question of clinical judgment and statistical factorial prediction in neuropsychology. They conclude, as Meehl has also repeatedly claimed (e.g., Meehl, 1954), that clinical judgment (the foundation for most neuropsychological judgment) is open to serious question due to clinical judgment errors. They suggest that one or more of the following issues may contribute to judgment errors: hindsight bias, confirmatory bias, overreliance on salient data, underutilization of base rates, and failure to analyze co-variation. They further criticize the time-honored and intuitive practice of analyzing patterned relationships because of two lines of research: (a) amount of information and accuracy, and (b) individuals' limited ability to process configural data. To buttress these conclusions, the authors cite a wide variety of poorly designed studies. They conclude that subjective appraisal is not an acceptable model of cognitive processing for clinical data analysis. Similarly, they acknowledge "that statistical modeling will never be adequate to capture the full richness, vitality, and complexity" of clinical decision-making. Although not providing specific suggestions as to how to combine these two extremes, Wedding and Faust do suggest that certain corrective procedures should be taken into account. The authors suggest the following: (a) know the literature on human judgment, (b) do not depend

on insight alone, (c) avoid premature abandonment of useful decision results, (d) regress extreme estimates, (e) limit focus on the esoteric, (f) avoid over-reliance on highly inter-correlated measures, (g) start with the most valid information, (h) consider alternative hypotheses, (i) consider disconfirmatory information, (j) think Bayesian, (k) collect appropriate norms, and (l) obtain feedback.

What is probably most distressing about Faust's work may not be his conclusion nor even his recommendations. Indeed, clinical neuropsychology should not be beyond the scrutiny of its practitioners nor of scientific methods. Popperian self-analysis and heuristic innovations are sorely needed in a field often considered closed to "outsiders."

What is distressing may be his style of encouraging the development of these studies. One need not look further than the scathing article in *Science* by Zyskin and Faust (1988) suggesting that accuracy of expert witnesses in psychology and psychiatry do not "surpass that of lay persons." Numerous articles in the lay press have further reduced open-minded consideration of the issue. Although the need for further scientific information is clear, one wonders about the need for such a global outpouring of uncertainty. Might not a more acceptable and heuristically useful method be to publish and critique within the boundaries of scientific protocol? It would seem that Faust may have committed the crime that he places on the expert witness; arriving at questionable conclusions, and reporting these conclusions to the wide segment

of the population eager for sensationalistic views of the health care system who are wholly unprepared to adequately assess the real issue Faust is addressing -- that is, the need for more accurate information. One need not look further than the prefaces of Faust's books (Zyskin, 1988) to see that he openly states that only half the data is actually presented - the half which calls into question the validity not only of expert witnesses but of psychology itself.

Relevance in Perspective

This situation is of great concern in forensic cases due to the issues of financial compensation discussed earlier. Forensic neuropsychological testimony does have a most significant impact on both the individual and society. However, not to provide neuropsychological evidence (as is clearly the approach of Faust and Zyskin as discussed above) would be of even greater disservice to the client and society. Allowing the use of strictly medical evidence (e.g., CT scans) to the exclusion of behavioral information clearly violates contemporary ethical and scientific norms.

Alternative strategies do exist. There is no need to avoid provision of sorely needed information in decisions about an individual's future. Similarly, there is no need to develop a practice that is restricted to forensic neuropsychology to the exclusion of other clinical service and /or teaching and research. The logical alternative is to proceed with caution as any thoughtful scientist-practitioner does. Clearly, the warnings of Faust and colleagues must be considered. Not to do so would eventually affect the

discipline and society. However, service to the legal community and also to clients can and should proceed -- but cautiously. First, additional research and attention should be devoted to this critical and controversial topic. At the level of the clinician, the advice provided by Wedding, et al., (in press) is an excellent foundation. Further advice is provided by Matarazzo (1987) who has suggested that the basis of conduct in forensic situations should be guided by application of the science of psychology.

Summary

Neuropsychology, in general, and clinical neuropsychology, in particular, are relevant as professional and scientific endeavors aimed at understanding brain-behavior relationships. There are numerous reasons for this conclusion, some of which have been elucidated in this article. These include:

1. The discipline has existed, exists presently, and continues to expand.
2. There are strong relationships to numerous related fields both within and outside psychology.
3. Clinical neuropsychology provides an excellent example of science and application combined.
4. A growing technology for the discipline has developed, especially in the last two decades.
5. Numerous applications are readily available for the field including in academic, clinical, and legal areas.
6. Little doubt exists that the field is faced with numerous questions. However, less doubt exists that solutions are either present or feasible.

In a recent commentary, Reitan

(1989) stated "We should not denigrate knowledge gained in the past in order to inflate the importance of our current intelligence" (p. 390). One wonders whether the question of relevance in clinical neuropsychology can be answered accordingly. Questions of validity and heritage aside, there is little doubt that the field is experiencing unprecedented growth. Our history may still be in our future -- and the future looks promising indeed.

References

- Faust, D., & Ziskin, J. (1988). The expert witness in psychology and psychiatry. *Science*, 241, 31-35.
- Faust, D., Guilmette, T. J., Hart, K., Arkes, H. R., Fishburne, F. J., & Davey, L. (1988). Neuropsychologists' training, experience, and judgment accuracy. *Archives of Clinical Neuropsychology*, 3, 145-163.
- Gaddes, W. H. (1968). A neuropsychological approach to learning disorder. *Journal of Learning Disabilities*, 1, 523-534.
- Golden, C. J., Hammeke, T., & Purisch, A. (1980). *The Luria-Nebraska Neuropsychological Battery*. Los Angeles: Western Psychological Services.
- Horton, A. M., Wedding, D., & Phay, D. (1981). Current perspective on assessment of a therapy for brain-damaged individuals. In C. J. Golden, S. E. Alcaparras, F. Stredes, & B. Graber (Eds.), *Applied techniques in behavioral medicine* (pp. 59-86), New York: Grune and Stratton.
- Incagnoli, T., Goldstein, G., & Golden, C. J. (1986). *Clinical application of neuropsychological test batteries*. New York: Plenum.
- Luria, A. (1973). *The working brain*. New York: Basic Books.
- Matarazzo, J. D. (1987). Validity of psychological assessment: From the clinic to the courtroom. *The Clinical Neuropsychologist*, 1, 307-314.
- Meehl, P. E. (1954). *Clinical versus statistical prediction: A theoretical analysis and a*

- review of the evidence. University of Minnesota Press.
- Meier, M. (1974). Some challenges for clinical neuropsychology. In R. M. Reitan, & L. A. Davidson (Eds.), *Clinical neuropsychology: Current status and application* (pp. 289-323). New York: John Wiley.
- Puente, A. E. (1989). Historical perspectives in the development of neuropsychology as a professional psychological specialty. In C. R. Reynolds, & E. Fletcher-Jantzen (Eds.), *Handbook of child clinical neuropsychology*. New York: Plenum.
- Reitan, R. M. (1989). A note regarding some aspects of the history of clinical neuropsychology. *Archives of Clinical Neuropsychology*, 4, 391-396.
- Reitan, R., & Wolfson, D. (1985). *The Halstead-Reitan Neuropsychology Battery*. Tucson, AR: Neuropsychology Press.
- Tarter, R. E., Van Thiel, D. H., & Edwards, K. L. (1988). *Medical neuropsychology*. New York: Plenum.
- Wedding, D., & Faust, D. (1989). Clinical judgment and decision making in neuropsychology. *Archives of Clinical Neuropsychology*, 4, 233-265.
- Walsh, K. W. (1978). *Neuropsychology: A clinical approach*. New York: Churchill Livingstone.

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