Letter to Editor

A Living Legend of Cognitive and Clinical Neuro Psychology

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As a M.Phil. C.P. intern (Academic Sessions 2005-2004) at IHBAS, Delhi; I had opportunity to meet and interact with Dr. C.R. Mukundan a former Professor from NIMHANS who visited IHBAS, Delhi during my tenure of training several times; to deliver invited guest lectures and to conduct two training workshops (each one of one-week duration).

His teachings and practical training were highly enriching, cogent and relevant academically and professionally for all curious M.Phil. C.P trainees of IHBAS at that time. When IHBAS had just emerged as a training centre of Clinical Psychologist on the national scenario. That is how we came to know the contribution of Professor Champadi Raman Mukundan to Cognitive and Clinical Psychology.

Talking about Neuropsychological Assessments, Cognitive retraining, Lateralization and localization to the current trend of ascertaining functional level was marvellous and lucidly explained to us by Professor Mukundan.

Professor C.R.Mukundan was Teaching, Clinical, & Research faculty at NIMHANS from 1974 to 2003, where he successfully set up the clinical facility in Clinical Neuropsychology. NIMHANS), Bangalore during 1975 -79 for testing brain dysfunction in patients with diseases of the brain. This was the first effort that started clinical neuropsychological examination procedure in India for neurological and neurosurgical patients.

Further at NIMHANS he developed Neuropsychology Battery of tests for testing brain dysfunction and their lateralization and localization. The battery consists of clinical examination procedures for detecting impairment and focal signs in different functional systems controlled from different cerebral lobes. The battery of tests evaluating and assessing various dysfunctions were validated against CT scan and neurosurgical findings in the

late 1980s. The battery is widely used in different clinical centers in India.

On the recommendations of Dr. Mukundan Neuropsychology was included as specialty subject for examination at the M.Phil. in Clinical Psychology at NIMHANS, which led to Neuropsychology being accepted as a specialty subject in other clinical disciplines of Neurology, Neurosurgery, Psychiatry, and Neurosciences. Neuropsychology Laboratory, of NIMHANS is the contribution of Dr. Mukundan, where he successfully set up

first Cognitive Electrophysiological Laboratory at NIMHANS in 1979 – 81; with provision of facilities for evoked potential and event related potential recording, (computerized), EEG analysis. Expanded by adding brain mapping system and EEGSYS program provided by NIAAA of USA in 1993. The first international publications from India on computed EEG and evoked and event related potentials are from the Neuropsychology Laboratory. He Designed and built a 32 channels EEG-ERP amplifier for use with the EEGSYS (EEG-ERP recording and analyses) program in 1993-94. Professor Mukundan also designed and built all necessary electronic supportive infrastructure for the laboratory. Who developed and headed a research team consisting of faculty from Psychiatry,Neurology, Neurosurgery & Neuropsychology for cognitive electrophysiological research.

His recent contribution is development of BEOS Profiling technique (Brain Electrical Oscillations Signature Profiling)

This is a technology for using brain electrical activation for recording the neurocognitive process of remembering since 1998. The technology was later used for eliciting remembrance of experiential knowledge in forensic applications. Brain Signature profiling technique is based on the findings that during awareness of past actions (autobiographical memory), the brain produces typical electrical oscillations, which form a Signature of the awareness of the experience remembered. Presence of brain electrical Signature, when provoked by a contextually relevant probe, is indication of the presence of Experiential Knowledge of the action/crime committed by an individual. Brain electrical oscillations signature profiling can be used to detect the presence of Experiential Knowledge of participating or committing the criminal act in question. The technology helps to find out the presence of such Experiential Knowledge in the brain of the suspect, if he or she has committed/participated in the act being investigated. The technique is based on the neurocognitive principles of acquisition and evaluation of signals elicited from the brain during retrieval of autobiographical information provoked by probes.

Brain electrical oscillations of the suspect is recorded using multi-channel amplifier system using a frequency pass band of 0.016 – 85 Hz. Special probes are designed in a "Nestled manner" and presented in auditory mode to the suspect. Control probes are used for validation of the techniques and Target probes are used for detecting "Experiential Knowledge" of the crime related activities

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suspected to have been committed. Additionally, the suspect's version, if present may also be included. A set of neutral probes involving primary semantic processing is used for correcting baseline activity.

The analysis consists of signal processing of the oscillations for computing the energy parameters, and measurement of time domain changes. The response provoked by each probe is statistically analyzed. The entire signal processing, statistical analysis and interpretation of the results are automatically carried out. The analysis detects primary processing or sensory registration of the probe, its encoding, source localization, attending to retrieved information, familiarity of the content, presence of Experiential Knowledge, etc.

All this was designed & developed I.e.the hardware and software for analysis with the help of a computer software company – Axxonet Solutions at Bangalore. Licensed the product to this company for manufacture and sale of the technology. International collaborations are being signed for the use of technology for service and research. International Patent for the BEOS technique is awarded. The BEOS technique is internationally considered a new memory-based paradigm for forensic testing of individuals as well as for medical assessment of memory of experiences. The test is already used in forensic laboratories at Mumbai and Gandhinagar. The test findings have already helped as aid for investigation in several cases which provoked national curiosity. Many more state, central, and international laboratories are in the process of acquiring the system.

Polygraph facility at the Neuropsychology Laboratory, NIMHANS for lie- detection testing purposes was another important area as part of collaborative agreement between NIMHANS and Forensic Science Laboratory, Bangalore in 1997. The facility was later shifted to Forensic Science Laboratory, Bangalore.

Brain Function Therapy developed by Mukundan is a computer software called Brain Function Therapy for (1) cognitive retraining in, children with learning disability, head injury and other brain lesion patients, and for (2) enhancement/enrichment of cognitive functions in normal children and adults (1993).

The program allows retraining and enhancement of brain functions such as selective and focused attention, working memory - both the Central Executive enhancement and widening and strengthening of verbal and visual buffer memory systems, encoding and transcoding, immediate and delayed verbal and visual recall, learning new associations, visual scanning, visuospatial perception – both analysis and synthesis, training in response inhibition. The program also involves methods for conceptual enrichment in different sensory – perceptual realms. Different versions of the program are commercially available for use in India and abroad. It is used by head injury patients, other brain lesion patients with cognitive deficits, children with learning disability, scholastic backwardness, etc., as well as for cognitive enhancement.

Neurobehavioral Control and Potentiality Measurement (NCPM) by Dr. Mukundan is a Computer administered test for measuring personality and potentiality of individuals in corporate organizations (2001). The test is based on the assessment of the type and levels neurocognitive controls used by an individual for the control of behavior and in developing cognitive styles, interpersonal skills, decision-making skills, and application of emotional intelligence, etc. It is a unique test for predicting the cognitive and behavioral richness and versatility of an individual. The test presents 40 different work situations with the several alternate choices for decision making, acting, and responding and the subject is expected to give his or her agreement – disagreement with each response.

The entire computer analysis carried on the response patterns of the individual is graphically represented.

The subscales of the test are (1) Goal Directed and Action Orientation, (2) Adaptability, (3) Pro-activeness, (4) Being Focused, (5) Team Sharing, (6) Work Completion, (7) Critical Thinking, (8) Problem Solving, (9) Risk Taking, (10) Conflict Confrontation, (11) Self-Expression, (12) Openness, (13) Discretion, (14) Empathy, (15) Sociability, (16) Cooperation, (17) Leadership, (18) Self-Dependence.

Looking at the wide range of Contribution by Professor Mukundan I feel he is a living legend of Clinical Neuropsychology in our country.