Neuro-Psychological Assessment of the Suspect by Applying Brain Electrical Oscillation Signature (BEOS) Profiling Test to Verify BEOS Principle

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ABSTRACT

Neuro-psychological assessment of the suspect by applying Brain electrical oscillation signature profiling (Brain mapping) test to verify BEOS principle. BEOS test is applicable in forensic field for detection of a person as suspect, accused, witness or complainant.

BEOS is based on EEG and its principle is neuro-psychology. Neuro-psychological criteria of BEOS system contains Experiential Knowledge (EK), Primary processing (PP), Encoding (EN), Emotional Response (ER), Activation Suppression (AS), Inattention (IN); etc. “32” electrodes EEG cap to be attached to a suspect and REM electrodes for rotatory eyes moment to be attached. An EEG gel to be fill for better conductivity.

Civil and criminal cases examined on BEOS system. As per NHRC guidelines a person willingly gave written consent to undergo for BEOS test as well as person’s jurisdictional court order to conduct a BEOS test is mandatory. Case related audio-visual pre-recorded probes presented to the suspect. Probes framed as neutral, general neutral and relevant point of view. A suspect has to seat in isolated room and he need not to give answer to the presented probes. “Right to remain silent” these constitutional rights are safe for suspect.

BEOS system does automatic EEG analysis and generates result in the form of Experiential Knowledge, Primary processing, Encoding, Emotional Response, Activation Suppression, Inattention.

Around 1420 sample of probes taken for neuro-psychological assessment. U/s: 302 of IPC’s real cases were taken and four person examined. Changes in the different frequency bands have different meaning in terms of cognitive and neuro psychological processing. In all four person’s BEOS automated result, i found Experiential Knowledge, Primary processing, Encoding,

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Emotional Response, Activation Suppression, Inattention shows different sum of digits. On that bases my first hypothesis depict wrong because BEOS is not analyzing total result. Result depends on person’s fact of story and his involvement in the offense and these makes difference in the result of EK, PP, EN, ER, A Supp, and Inattention.

Sum of four person’s result percentile shows above 95% suspect was aware during the BEOS test, so my second hypothesis “BEOS principle is neuro-psychology, it is baseless principle; which Ho is rejected because suspect was neuro-psychologically aware during BEOS test so that their results of EK, PP, EN, ER, A Supp, Inattention counted different values as per their involvement.

NABL Scope of Accreditation report mentioned that BEOS test is for verification of veracity of statement of the suspect, accused, witness, complainant and victim. BEOS instrument’s range of testing and limits of detection is .99 (200). These research supports NABL scope report of BEOS range testing limits and makes confirmation that BEOS principle is neuro-psychology which is true.

**Keywords:** Neuro-Psychology, Brain Electrical oscillation, Brain mapping, BEOS principle.
statistical analysis. Auto analyzed BEOS report taken for data analysis. The change in the power profile in each segment are classified into EK(Experimental Knowledge), EM response, NE response, Encoding present and primary processing present. Changes in the different frequency bands have different meaning in terms of cognitive processing. Software generates the result in the following category for the interpretation from the forensic angle. BEOS result and it’s individual count of Experiential Knowledge, Primary processing, Encoding, Emotional Response, Activation Suppression, Inattention are granted for persons neuro-psychological assessment. Percentage counted from total number of probes of each sets elects neuro-psychological assessment of person who was aware during whole examination.

Dr. S.L Vaya (2005-2007), Additional Director and Principal investigator of National Resource center, Forensic Psychology DFS Gandhinagar, Gujarat, India. Book referred: Forensic Psychology’s National Resource center (2013). In the year of 2003 BEOS system, procedure and it’s report was examined for reliability and validity. Reliability and validity of BEOS system also verified by judicial magistrate and legal personal. This book supports experimental research results of BEOS that persons BEOS result based on memory, visual image, cognitive and neuro-psychological.

**OBJECTIVE OF THE STUDY**

BEOS is noninvasive technique. Brain electrical oscillation signature profiling is based on the principles of neuro-psychology. Researcher objective is to study and compare result of BEOS test to testify principal of BEOS test.

**Hypothesis:**

1. There will be no significant difference in neuro-psychological assessment of BEOS result like Experiential Knowledge, Primary processing, Encoding, Emotional Response, Activation Suppression, Inattention.
2. Brain electrical oscillation signature profiling is based on the principles of neuro-psychology, which is baseless principal.

**METHOD**

**Sampling:**

Samples were collected from DFS Gandhinagar Gujarat, Forensic Psychology Division, two cases and four subjects are taken for research. Prior oral permission of research is taken from concern officers. Around 1420 probes sample framed as per the case and examined on BEOS. This research is not related to particular crime or suspect but it focused suspects’ neuro-psychological assessment of awareness to particular probes. In this research nobody’s feeling is hurt only auto analyzed digit data of BEOS result is taken for research.
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**Tools:**
BEOS (Brain electrical Oscillation Signature Profiling) system N.S.S system includes EEG, Head map generator and VASP system taken for probes recording. 32 electrodes EEG cap, EEG gel, REM sensors. N.S.S system is interconnected with three computers and Axxonet software.

**Procedure:**
As per NHRC rules, when person gave written consent then only BEOS test will proceeds. Along with person’s consent related jurisdictional court order is mandatory to conduct BEOS test. Under this test reserves the right of the subject to remain silent under Article 20 (3) of the constitution.

In BEOS test a EEG cap attached with 32 electrodes. 32 channels recording of the electrical activity of the brain was carried by placing 30 cephalic electrodes with reference electrodes in the ear lobes, and 2 channels for recording the eye movements. Initially the baseline recording was done with eyes closed and eyes opened. Then neutral probes were presented before presenting crime/event related probes in different scenarios to the subject and the EEG is acquired and analyzed electrical oscillation from the brain were picked up using electrodes placed at standard position such as:

FP1, FP2, AF3, AF4, F7, F3, F8, F4, FT7, FT8, FC3, FC4, T3, T4, C3, C4, TP7, CP3, TP8, CP4, T5, T6, P3, P4, O1, O2, Fz, Cz and CPz.

The subject has to seat in isolated lab room along. On BEOS test suspect’s narration and hypothetical auditory probes and visual probes are presented. The changes in the power profile in each segment are classified into EK(Experimental Knowledge), EM response, NE response, encoding present and primary processing present. **Changes in the different frequency bands have different meaning in terms of cognitive and neuro psychological processing.** Software generates the result in the category for the interpretation from the forensic angle. 1. **Experimental Knowledge (EK):** Activity related to remembrance of the experience triggered by the probes present. Presence of significant increase in activation level is the base. 2. **Emotional Response (EM):** Encoding present accompanied by overwhelming blanking of further
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processing. Probe has produced significant decrease (presence of high level of Desynchronization) in the activity of delta, theta, alpha, beta, gamma bands or no change in the activation level in the above bands, during and after probe presentation. The response is an indication of emotional stunning on hearing the probe. 3. Negative Response (NE): Probes had produced negative response equivalent N400. NE values are above 100 micro volts, it is treated as artifact. 4. Encoding (En): this is used when the probes has produced significant increase in activation in the delta, beta, gamma bands but without increase in 0-2Hz activity. 5. Primary Processing (PP): This is used when the probes had produced significant increase in activity only in the beta bands. 6. Inattention (In): Activity related to registration of the probe is not detected.

On presentation of the probes, graph being generated and EK is elicited. BEOS is applicable in cases, wherein major offenses and some evidence is available. Later BEOS test result like experiential knowledge is elicited from the subject about the crime. The result is in the form of EEG and by EEG graph, system analyze automated result in the form of Experiential Knowledge, Primary processing, Encoding, Emotional Response, Activation Suppression, Inattention. Test procedure proceeds at about 45 minutes to 1 hour for per person per set of audio probes. During test person need not to answer to particular probe. Person have to seat quietly while audio probes presentation. Probes are not full question it’s just short sentence which are pre-recorded in BEOS system. BEOS is known as (N.S.S) Neuro signature system.

Variable:
1. BEOS examine consider as independent variable.
2. Result (Scores) of BEOS is Dependent variable.

Data analysis:
BEOS auto analyzed result shows various digital values of EK, Encoding, Inattention etc., Which counted in percentage value.

Neuropsychological assessment of the suspect

<table>
<thead>
<tr>
<th></th>
<th>Set1</th>
<th>Set2</th>
<th>Set3</th>
<th>Total Probes</th>
<th>% of Neuro-Psy awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspect case (1)</td>
<td>Total :129 Probes presented</td>
<td>Total :133 Probes presented</td>
<td>262</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15/B/24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiential Knowledge (EK)</td>
<td>15</td>
<td>17</td>
<td>Nil</td>
<td>32</td>
<td>12.21%</td>
</tr>
<tr>
<td>Primary Processing (PP)</td>
<td>37</td>
<td>42</td>
<td>-</td>
<td>79</td>
<td>30.15%</td>
</tr>
<tr>
<td>Encoding (EN)</td>
<td>71</td>
<td>73</td>
<td>-</td>
<td>144</td>
<td>54.96%</td>
</tr>
<tr>
<td>Emotional Response (ER)</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>00</td>
<td>00.00%</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th></th>
<th>Suspect case (2) 15/B/24</th>
<th>Suspect case (3) 15/B/24</th>
<th>Suspect case (4) 15/B/28</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total :132 Probes presented</td>
<td>Total :118 Probes presented</td>
<td>Total :154 Probes presented</td>
</tr>
<tr>
<td>Inattention (IN)</td>
<td>05 05</td>
<td>04 05</td>
<td>05 05</td>
</tr>
<tr>
<td>Activation Suppression (AS)</td>
<td>01 02</td>
<td>03 06</td>
<td>01 10</td>
</tr>
<tr>
<td>Total Percentage of Neuro-psychological assessment of awareness during whole test</td>
<td>98.09%</td>
<td>95%</td>
<td>98.35%</td>
</tr>
<tr>
<td>Experiential Knowledge (EK)</td>
<td>23 29</td>
<td>17 32</td>
<td>15 23</td>
</tr>
<tr>
<td>Primary Processing (PP)</td>
<td>34 70</td>
<td>65 133</td>
<td>49 50</td>
</tr>
<tr>
<td>Encoding (EN)</td>
<td>64 133</td>
<td>141 225</td>
<td>12 50</td>
</tr>
<tr>
<td>Emotional Response (ER)</td>
<td>04 07</td>
<td>01 01</td>
<td>12 147</td>
</tr>
<tr>
<td>Inattention (IN)</td>
<td>04 05</td>
<td>05 07</td>
<td>05 07</td>
</tr>
<tr>
<td>Activation Suppression (AS)</td>
<td>03 06</td>
<td>03 06</td>
<td>03 11</td>
</tr>
<tr>
<td>Total Percentage of Neuro-psychological assessment of awareness during whole test</td>
<td>95%</td>
<td>98.35%</td>
<td>10.37%</td>
</tr>
</tbody>
</table>
RESULT AND DISCUSSION

1. Case no:1= Total percentage (%) of neuro-psychological awareness is : 98.09 %.
2. Case no:2= Total percentage (%) of neuro-psychological awareness is : 95.00 %.
3. Case no:3= Total percentage (%) of neuro-psychological awareness is : 98.35 %.
4. Case no:4= Total percentage (%) of neuro-psychological awareness is : 97.51 %.

On the basis of above percentile neuro-psychological assessment analyzed. It is clear that all four people were above 95.00% aware during their BEOS test. While remaining percentage counted as artifact, Inattention etc.

CONCLUSION

Here in this research first HO is = There will be no significant difference in neuro-psychological assessment of BEOS result like; primary processing, experiential knowledge, encoding, emotional response, activation suppression. These HO is rejected because in different criteria of BEOS automated analysis result shows percentile variation in primary processing, experiential knowledge, encoding, emotional response, activation suppression.

Second H/O= BEOS is based on the principles of neuro-psychology which is base less principle. These HO is rejected because EEG cap attached to a person and case related probes were presented during this procedure then suspect were aware in relevant, general neutral probes and neutral probes. All four person’s neurological and psychological criteria like: primary processing, experiential knowledge, encoding, emotional response, activation suppression, were counted together so it shows above 95.00 % all four persons were neuro-psychologically aware during the BEOS test.

NABL Scope of Accreditation report (year: 2014) mentioned that BEOS test is for verification of veracity of statement of the suspect, accused, witness, complainant and victim. BEOS instrument’s range of testing and limits of detection is .99 (200). This research supports NABL report of ‘BEOS range testing limits of detection’. Hence, the BEOS is bases on the principles of neuro-psychology which depict valid and true by this research.
REFERENCE:


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