

## **Information Processing Deficits and Post Concussion Syndrome: Role of Symptoms**

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### ***Abstract***

Information processing tests (visual) were administered on patients with Post Concussions Syndrome and two control groups viz, anxiety neurotics with similar symptoms and normal controls. Sample size was eighteen in each group. Deficits were found on serial and parallel processing in patients with PCS, whereas patients with anxiety neurosis did as well as normals.

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Key words -

**Post Concussion Syndrome,  
Anxiety neurosis,  
Information processing deficits**

Information processing tests have identified subtle neuropsychological deficits in patients with post concussion syndrome [1], [2]. The presence of these distressing symptoms such as anxiety, fatigue as being responsible for a poor performance on these tests was suggested in an earlier report [2]. The present study is an attempt to examine these deficits in patients with post concussion syndrome (PCS) vis a vis patients who have similar symptoms without a history of head injury.

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### **Method**

Adult patients with three of the following ten concussion symptoms i.e., headache, dizziness, noise intolerance, fatigue, irritability, poor memory, poor concentration, anxiety, depression and insomnia, for a period of at least 2 months were chosen from the patients attending the specialized clinic for the care of neuropsychiatric complication of head injury.

Patients who had evidence of unconsciousness over 6 hours post trauma, post-traumatic epilepsy, neurological deficits, depressed skull fracture, intracranial haemorrhage or onset of symptoms 3

months after injury were eliminated. Eighteen such patients were tested. To have a uniform diagnostic group in neurosis, patients with a diagnosis of anxiety neurosis [3], with no history of head injury were chosen if in addition to anxiety they also had two of the other nine 'Post Concussion Symptoms' listed above. Eighteen of the first forty three patients who attended the adult psychiatry out patient were tested. No patient in either diagnostic group was receiving and psychotropic drug in the fortnight prior to testing.

The duration of symptoms for patients in the PCS group ranged from 2 months to 10 years with a mean of 2 years and 3 months, while in the anxiety neurosis group it ranged from 2 months to 6 years with a mean of 2 years 3 months. The two groups did not differ in the duration of symptoms ( $X^2=.5$ , NS).

A group of eighteen normal controls who had no psychiatric or neurological disorder and who were unrelated to patients of either sample were also tested. Relevant variables like age, sex and educational status were recorded for subjects of all three groups (Table 1). The two patient groups did not differ in terms of age ( $x^2=0.06$ , NS), sex distribution ( $x^2=1.05$ , NS) and educational status ( $x^2=.06$ , NS).

*Table I - Relevant Subject Variables*

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*Table II - Mean Number of Correct Responses (MNCR) in the recognition threshold test.*

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Two tests of information processing were employed. The recognition of a visual stimulus by pressing the appropriate response button. One of the four single digits (2, 3, 5 and 6) displayed at intervals of five seconds, for durations of 20, 40, 80, 160, 320, 640, 1280 or 2560 milli seconds, ten times in each stimulus duration was the stimulus. The order of the digits and the duration of exposure were randomised. The number of correct recognition (NCR) at each stimulus duration formed the score. The span of apprehension test comprised of recognition of as many as possible of the nine single digits presented visually for a duration of 200 milli seconds in a random order in an array of three rows and three columns. Forty such stimulus presentation trials were administered at an interval of five seconds each.

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## Results

### Recognition threshold test :

Number of correct responses in the recognition threshold test was averaged for each group Mean Number Correct Responses (MNCR) in Table 2. Analysis of Variance (ANOVA) (with repeated measures) found significant effects of group ( $F=27.7$ ,  $P < .01$ ) stimulus duration ( $F=28.6$ ,  $P < .01$ ). Interaction between group and stimulus duration was also significant ( $F=1.8$ ,  $P<.05$ ). The three groups correctly identified the stimuli more often with increasing stimulus durations. Differences in MNCR's between the groups are present only till 160 ms. stimulus duration (Newman-Keuls test). Examining the nature of group differences at 20, 40 & 80 ms, using the Newman Keuls test, the PCS group had significantly lesser MNCRs than the normals and anxiety neurotics, at all the three stimulus durations.

But the MNCRs of anxiety neurotics and normals did not differ significantly. The serial processing of anxiety neurotics is similar to normals throughout the range of stimulus durations, while that of PCS patients is less efficient than the other two groups, at the shorter stimulus durations.

### **Span of apprehension test :**

Parallel processing which develops with practice was studied using this test. The numbers recognised were summated over successive ten trial blocks for each patient (Table 3). ANOVA (repeated measures) indicated significant group ( $F=4.53$ ,  $P < .05$ ), and block effect ( $F=4$ ,  $P < .01$ ), the group and block interaction was non-significant. The significant groups effect could not be localised to any particular trials blocks (Newman-Keuls test). Analysing the block effects through paired t tests, a significantly greater number were seen in the second trial block than the first, in all the three groups (patients with PCS  $t=3.64$ ,  $p < .01$ , anxiety neurotics  $t=2.7$ ,  $p < .02$ , normals  $t=4.34$ ,  $p < .01$ ). Patients with PCS did not improve with further practice, whereas further improvement with practice from second to third trial blocks occurred in anxiety neurotics. ( $t=1.95$ ,  $p < .1$ ) and normals ( $t=1.85$ ,  $p < .1$ ), although beyond this both the groups show no further improvement.

*Table III - Numbers reported in the span of apprehension test*

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## **Discussion**

This study was an attempt to control for the presence of symptoms in the genesis of deficits on information processing tests in patients with PCS. We have found that patients with PCS were deficient than the other two control groups both in serial processing and in the development of parallel processing. Apparently symptoms have not affected the performance on these tests, as the control groups of anxiety neurotics who have symptoms similar to the symptoms of PCS have done as well as normals. The study has enhanced the strength of association between PCS and information processing deficits which has been observed earlier. Further research is required to examine the role of head injury per se in the genesis of these deficits.

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