MANUAL ASYMMETRIES IN PERSONS WITH DOWN'S SYNDROME

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It is a well established fact that the brain has anatomical asymmetry, functional asymmetry, chemical asymmetry and pharmacological asymmetry. Such a lateralization enables the human beings to learn and to adapt to the changing environment with greater ability. (Geschwind & Galaburda 1985a).

Studies on laterality and their implications for learning have hitherto focussed mostly on the areas of learning disabilities and focal brain damage. Such studies in persons with mental retardation have been carried out lately (Hiscock & Kinsbourne 1987, Geschwind and Galaburda 1985b, Sopet et al 1987) and certain patterns of cerebral specialization have been demonstrated in persons with Down's syndrome (Hartley 1981, Elliot 1985, Elliot et al. 1986).

Studies on hemispheric specialization should ultimately find an application in the methods of teaching and curriculum designing which facilitate optimal learning. Manual asymmetries such as finger tapping, and hand, eye and leg preferences reflect the cerebral asymmetries.

Keeping this in view, a study was conducted to find out the manual asymmetries in individuals with Down's syndrome, non-Down's syndrome mental retardation and normal controls using finger tapping methods and hand, eye and leg preferences.

Material and Methods

The apparatus consisted of a tapping unit linked to one of the ports of SCL-ANKUR micro computer. The software was programmed to determine the tapping frequency, mean depression time and mean release time and calculate the standard deviations of all the above. The unit could also measure the number of taps for the time intervals of 5 secs. and 10 secs., which allowed for choosing the appropriate time interval.

In addition to the tapping unit, a comb, a ball, a mono slide viewer and a hammer peg board were used to find out the preference of hand, eye and leg.

The subjects consisted of 12 persons with Down's syndrome (DS) and 12 mentally retarded persons without Down's syndrome (NDS) receiving services at the NIMH, Secunderabad. The normal control group (NC) comprised children from a school for normal children.

The age and IQ of DS persons ranged from 9 years to 16 years and 30 to 70 respectively, while in the NDS persons they ranged from 10 years to 19 years and 33 to 55 respectively. The normal controls were aged between 10 and 15 years. While no formal IQ test was administered to the normal control, care was taken to select only those who maintained academic record expected for their level.
The eye, hand and leg preferences of the subjects were determined by asking each subject to view through the monoslide viewer, hammer the pegs on the peg board, throw the ball, comb their hair and kick the ball. The subjects were given three trials in each of these tasks and a score of one was given either to the right or to the left based on the preference. The subject was graded as pure right or pure left if the total score was 15 on either of the hands. If the scores were distributed in between both the hands, the subject was grouped under mixed preference group. The subjects then performed the finger tapping task with their index fingers after a demonstration and a trial.

**Results and Discussion**

Table 1 gives the mean and standard deviation of the tapping frequency. The raw data shows in DS and NDS, the mean difference between the right and the left hand tapping frequency is one whereas the mean tapping frequency in normal controls differed by 15. This shows that in the normal control group there is an asymmetry in the performance on finger tapping while this is not exhibited in the groups with mental retardation.

A 3 x 2 analysis of variance revealed a main effect for group F, (2.66) = 42.7, P<.05 while there was no significant difference between handedness and group x hand interaction. An observation of the raw score between the hands for the NC group showed a difference of 15. On a 't' test, the significance was observed at P .10 level. This requires further study on a larger sample.

An analysis of the eye, hand and leg preference showed that in the DS group only two persons had pure right sided preference while 10 of them showed mixed preferences. In NDS group 6 persons showed pure right sided preference and one person showed pure left sided preference and 5 showed mixed preference. In the NC group only 2 exhibited mixed preference and 10 were purely right sided. It is interesting to observe that in DS the majority had mixed preference.

| Table 1                              |
|--------------------------------------|
| Tapping Frequency                    |
| Group | Right hand Mean | Right hand S.D. | Left hand Mean | Left hand S.D. |
|-------|-----------------|-----------------|----------------|----------------|
| DS    | 53              | 14.73           | 54             | 13.17          |
| NDS   | 63              | 15.20           | 62             | 19.61          |
| NC    | 105             | 18.06           | 90             | 19.02          |

This matches with the minimal difference in tapping frequency between the left and the right hands.

In the NDS group, it was observed that the mean tapping frequency was almost equal in both right hand and left hand. One of the reasons for this could be that one of the NDS subjects was purely left handed and 5 of the subjects had mixed preference.

It has been generally observed that there is a high frequency of left handedness in mental retardation (Geschwind & Galaburda 1985b). As early as 1920, Gordon observed an incidence of left handedness in 18.2% among 4620 mentally retarded children whereas that in 3298 normal school children it was 7.3%. Similarly, Hicks & Barton (1975) found an incidence
of left handedness in 20.7% of 550 mentally retarded persons. However, Soper et al. (1987) reported a high incidence of mixed handedness among a group of 73 mentally retarded children. The present study is in concurrence with that of Soper et al.'s (1987).

The present study reveals that persons with DS do not exhibit any significant difference between the right and left hand on a finger tapping task and show a high percentage of mixed handedness.

The non Down's syndrome MR children also do not show any significant difference between the hands on the finger tapping task and they also exhibit more of mixed handedness compared to normal controls.

This study is reported with the hope that it will stimulate in-depth studies in the area of hemispheric specialization especially in persons with mental retardation which would further lead on to the newer methods of curriculum designing for the mentally retarded persons. Such efforts would help in the application of the findings in the medical field on to that of education.

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