

INFLUENCE OF HANDEDNESS ON THE VISUAL AND AUDITORY REACTION TIME

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Abstract: Visual Reaction Time (VRT) and Auditory Reaction Time (ART) were measured in right-handed and left-handed human volunteers, using an Electronic Response Timer Unit. The study demonstrated that a group of left-handed women reacted faster ($P < 0.05$) with their left hand to an auditory stimulus than their counterpart using their right hand. VRT did not show any significant change within, and between, the groups and was not influenced by sex or age. The observed differences in ART may be due to central phenomenon.

Key words: right handers left handers sensory motor performance

INTRODUCTION

Handedness is related to hemispheric specialization and appears to be genetically determined (1). A right-handed person is one who uses the right hand, preferentially, in all acts calling for dexterity or strength, while the left handers prefer their left hand for similar acts (2). The study of reaction time affords a simple means of evaluating sensorimotor performance (3). It has been reported in the literature that Auditory Reaction Time (ART) and Visual Reaction Time (VRT) are altered in patients suffering from diabetes mellitus (4) and schizophrenia (5) and in normal people after yogic training (6). This paper is a study on the influence of handedness on ART and VRT.

METHODS

The study was carried out on 100 apparently

healthy human volunteers of both sexes, drawn from student and staff population of Kasturba Medical College, Manipal, Karnataka State. The subjects were divided into 60 right handers and 40 left handers, selection based on the criterion stated above (2). The men and women formed separate groups, each of which is further divided into two age groups of 18-25 years and 26-30 years. The mean age group is shown in Table I.

ART and VRT were measured using an Electronic Response Timer Unit (MULTITECH), a micro-processor based system that can be programmed to measure the reaction time of the subject either to auditory stimulus or light stimulus. The unit, after energising, gives an impulse which can be visual or auditory or both. The subject is asked to press a particular button in the panel of the unit with the index

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finger of each hand separately as and when he sees/hears the stimulus. The intensity of the stimulus is kept constant for all the subjects. The timer unit counts the time elapsed between the presentation of the stimulus and pressing of the button in ms.

The system utilizes a crystal oscillator functioning at 3.2 M.Hz internal frequency for the micro-processor chip, supported by peripheral ICs. To start with, the micro-processor initiates the counter on a button press, to 0000 ms and gives a stimulus pulse of fixed duration. Different programme is used for producing auditory (beep) and light stimuli. The counting in ms continues till the subject presses a button which he does the instant he sees or hears the stimulus, as the case may be. At the press of the button, the programme stops counting and the reaction time is shown on the Light Emitting Diode (LED) display.

All measurements of ART and VRT were made

in a sound proof room, the ambient temperature maintained at $26 \pm 1^\circ\text{C}$. The mean of 3 similar readings from a minimum of 10 readings was taken for each hand of all the subjects and standard deviation and standard error of the mean were calculated. Statistical significance of results were worked out by applying students' 't' test.

RESULTS

The mean \pm SD \pm SEM values of ART and VRT in ms for right handers and left handers for each hand are shown in Table I. Use of either hand has not affected VRT to any significant extent, within and between the groups, irrespective of age and sex. But, for ART, the left-handed women of both age groups reacted significantly faster with their left hand compared to the right-handed younger women when they used their right hand ($P = < 0.05$).

TABLE I: VRT and ART of Right-handed and Left-handed - Handwise (Mean \pm S.D. \pm S.E.M.ms).

Group	Mean Age in yrs	VRT		ART	
		Right Hand	Left hand	Right hand	Left hand
<i>Right-handed</i>					
Men	20.4	202 \pm 27 \pm 7	200 \pm 31 \pm 8	200 \pm 31 \pm 8	214 \pm 38 \pm 10
	27.0	201 \pm 27 \pm 7	201 \pm 27 \pm 7	199 \pm 27 \pm 7	210 \pm 35 \pm 9
Women	20.2	211 \pm 38 \pm 10	211 \pm 38 \pm 10	211 \pm 38 \pm 10**	213 \pm 35 \pm 9
n = 15 each group	26.8	210 \pm 38 \pm 10	210 \pm 38 \pm 10	210 \pm 38 \pm 10	210 \pm 35 \pm 9
<i>Left-handed</i>					
Men	20.3	200 \pm 31 \pm 10	196 \pm 25 \pm 8	210 \pm 35 \pm 11	198 \pm 25 \pm 8
	27.2	202 \pm 31 \pm 10	198 \pm 25 \pm 8	212 \pm 35 \pm 11	195 \pm 22 \pm 7
Women	20.4	210 \pm 35 \pm 11	201 \pm 29 \pm 9	199 \pm 25 \pm 8	190 \pm 22 \pm 7*
n = 10 each group	26.6	212 \pm 35 \pm 11	203 \pm 29 \pm 9	200 \pm 25 \pm 8	191 \pm 19 \pm 6*

(*) 'P' Value < 0.05 compared to (**)

DISCUSSION

The results demonstrate clearly that limb dominance has no influence on VRT. The left handed women demonstrating a faster ART through their left hand compared to one group of right handed women using their right hand cannot be explained on conduction velocities of peripheral nerves. For, the index finger was used in the study and the muscles involved in pressing the button are supplied by the median nerve and our earlier study has clearly indicated that the median nerve conducts significantly faster in both hands of right handers compared to left side of left handers (7). It is well documented that auditory pathways relay extensively to both temporal lobe auditory areas. This implies that both hemispheres hear

the same things equally (8). On the other hand, the visual pathways, especially macular area of the retina, have clear cut bilateral representation. In 96% of right handed persons, forming 91% of the human population, the left cerebral hemisphere is dominant or categorical, and the right being dominant in the remaining 4%. In left handers, 15% have the right as dominant, 15% have no clear lateralization and in the remaining 70%, left hemisphere is the dominant one (9). The result relating to ART differences between right and left handers among women may be due to the fact that a relatively good proportion of left handed persons appears to lack distinct lateralization. Further studies, namely, the recording of auditory evoked potentials simultaneously from both temporal lobes may yield a better explanation.

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