EFFECT OF LIMB DOMINANCE ON PERIPHERAL SENSORY NERVE CONDUCTION VELOCITY

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ABSTRACT

BACKGROUND
Nerve Conduction Study is a pure physiological measure of the speed with which the electrical impulses are transmitted along the peripheral nerve fibres and across synapses, involving no cognitive activity. Various anatomic and physiologic factors affecting the conduction velocity of the nerve are well studied except handedness, which could be the probable reason behind disproportionately large number of artists, musicians and mathematicians being left-handers. Hence, the study was undertaken to evaluate the Nerve Conduction Velocity taking handedness aspect into consideration.

MATERIALS AND METHODS
The study was done in accordance with the Institutional Ethical Committee standards. The study included 100 medical students (10 left handers and rest right handers) in the age group 17–21 years. Sensory Nerve Conduction Velocity (NCV) of median and ulnar nerves on both the sides were recorded using RMSEMGEPMK2 software Equipment. Stimulation was done using standard supramaximal technique using a square wave pulse of 0.1 ms duration, distance measured by metal tape and velocity calculated. Results were expressed as Mean ± S.D. For comparisons between the groups (right and left handers), Student's unpaired 't' test was used and a p value of less than 0.05 considered as significant.

RESULTS
Sensory nerve conduction velocities (in metres per second) of median and ulnar nerves of both the sides in left-handed individuals were higher compared to their right-handed counterparts. But this difference was significant in the ulnar nerve (p=0.012).

CONCLUSION
The study concludes that the left-handed individuals have faster sensory nerve conduction velocity compared to right handers.

KEYWORDS
Handedness, Nerve Conduction Velocity, Limb Dominance.

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BACKGROUND

The economic, social and personal burden of common neurological disorders have been the subject of intense study all over the world.[1] The widespread interest in disorders of peripheral nervous system, which has burgeoned in recent years, primarily has its origin in the introduction of new investigating techniques.[2] With the advent of newer technologies there has been a tremendous increase in the number of patients with nerve disorders.[3] Nerve Conduction Study is a part of electrodiagnostic procedure that helps in establishing the type and extent of the abnormality of the nerves.[4]

Nerve Conduction Study is a pure physiological measure of the speed with which the electrical impulses are transmitted along the peripheral nerve fibres and across synapses, involving no cognitive activity.[5] The conduction velocity of the nerve depends on anatomical factors such as the fibre diameter, degree of myelination and the internodal distance.[6] Other factors such as age, temperature, height, gender and limb are the well-known physiological variables affecting Nerve Conduction Study.[7] The effect of handedness on nerve conduction is not known much and needs further evaluation. Cerebral dominance is a known fact and has its effect in terms of speech, handedness, facial recognition, etc. Lateralisation of nerve conduction velocity is also expected.

Disproportionately, large number of artists, musicians and mathematicians are left-handers.[8] So far, not much data has been collected on motor Nerve Conduction Velocity taking handedness aspect into consideration. Hence, this study is undertaken to observe if any difference in limb dominance translates into difference in nerve conduction velocity, which will have far reaching real life implications.

MATERIALS AND METHODS

The study titled "Effect of limb dominance on peripheral sensory nerve conduction velocity" was conducted in the Department of Physiology, SSIMS & RC, Davangere. This study included 100 young medical students (10 left handers and rest were right handers) of both the genders in the age group 17–21 years. Those individuals using their left hand either for dexterity or strength or both were labelled as left handers. After taking a detailed written informed consent, preliminary details with complete history was recorded. The study was done in accordance with the Institutional Ethical Committee Standards.

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Exclusion Criteria

Peripheral nerve injury, metabolic disorders, fracture, deformity, radiculopathy, nerve compression, neurological disorder, intake of drugs, or any addictions.

Subjects were called in the morning after light breakfast to get acclimatised in an air-conditioned room (21–23° C) for 15 minutes. Sensory Nerve Conduction Velocity (NCV) of median and ulnar nerves on both the sides were recorded using RMSEMGEPMK2 software equipment. Stimulation was done using standard supramaximal technique using a square wave pulse of 0.1 ms duration, distance to be measured by metal tape and velocity calculated.

Statistical Analysis

Results were expressed as mean±S.D. For comparisons between the groups (Right and left handers), Student's unpaired't' test was used and a p value of less than 0.05 considered as significant.

RESULTS

A total of 100 subjects (10 left handers & 90 right handers) were included in the study. The mean age (in years) was 20 in left handers and 19.73 in right handers. There was no significant difference in the age in the two groups (p = 0.474) (Graph-1). Gender wise comparisons showed no significant difference between the two groups (Graph-2).

Mean height (in centimetres) was 170.20 in left handers and 169.76 in right handers with no significant difference. Mean weight (in kilograms) was 71.10 in left handers and 66.37 in right handers with no significant difference (Graph-3).

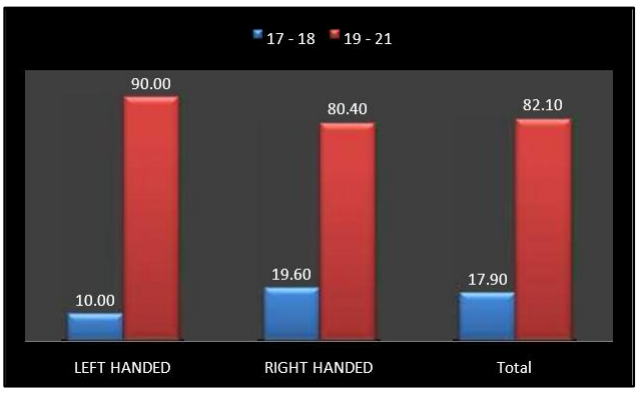
Comparison of Nerve Conduction Velocity

Sensory nerve conduction velocities (in metres per second) of median and ulnar nerves of both the sides in left-handed individuals were higher compared to their right-handed counterparts.

But this difference was significant only in the ulnar nerve (p=0.012) (Table-1, Graph-4).

Sensory Nerve Conduction Velocity	Handedness				
	Left Handed		Right Handed		P-value
	No. of Cases	Mean±S.D	No. of Cases	Mean ± S.D	
Left median nerve	10	56.24±6.12	90	54.87±6.07	.522
Left ulnar nerve	10	54.30±7.13	90	47.76±7.86	.012
Right median nerve	10	54.02±4.10	90	53.58±9.73	.890
Right ulnar nerve	10	52.11±5.92	90	50.39±6.49	.416

Table 1. Comparison of Sensory Nerve Conduction Velocity in Right and Left Handers



Graph 1. Comparison of Age in Right and Left Handers

Graph 2. Comparison of Gender in Right and Left Handers

Graph 3. Comparison of Height & Weight In Right and Left Handers

Graph 4. Comparison of Sensory Nerve Conduction Velocity in Right and Left Handers

DISCUSSION

The subjects selected for our study belonged to the age group of 17–21 years. As the study was carried out in a laboratory at constant temperature, the results cannot be attributed to variations in temperature. Krishnamurthy et al demonstrated that there is no influence of sex on nerve conduction.[9]

The human nervous system adapts to the functional requirements with considerable plasticity depending on the use, the physiological characteristics and response changes. In the past decade, several researchers reported differences in physiology between the dominant and the nondominant upper limb.[10]

In this study, we report a higher sensory nerve conduction velocity in left handers compared to right handers with a significant difference in the left ulnar nerve. Other sensory nerve conduction velocities were also higher in left handers though not significant. Asymmetry of sensory nerve conduction velocity was also detected by Bromberg et al.[11] Higher sensory nerve conduction velocities in left handers may be because of genetic reasons and this may contribute to functional differences during growth in early childhood.

Similar results were also reported by earlier studies like Gupta et al[1] and Tayade et al.[6]

CONCLUSION

The study concludes that the left-handed individuals have faster sensory nerve conduction velocity compared to right handers. Further, this difference should be taken into account before making any neurological diagnosis in left handers.

Though this study is by no means exhaustive, it does provide a glimpse of the differences between the sensory nerve conduction velocity in left and right handers. Further research is necessary to deduce a definite relationship between NCV and cognitive parameters such as the Intelligence Quotient.

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Suggestions

Individual differences in intelligence could be viewed as being to some degree attributable to differences in the speed and efficiency with which neurophysiological processes occur.

Peripheral NCV is considerably easier and less expensive measure than many of the previously investigated physiological correlates of intelligence such as cerebral blood flow and cerebral glucose metabolic rate. Results from our study provides input to further studies on human intelligence and handedness to provide an understanding of the biological basis of the individual differences in intelligence and mental abilities with reference to limb dominance.

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