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### **Effect of different physiological factors on motor and sensory latency of upper and lower limb nerve conduction studies- An evidence based study.**

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#### **ABSTRACT**

Nerve conduction studies are valuable aid to investigate and quantify the physiological activity of peripheral nerves. These include measurement of sensory and motor conduction velocities and latencies of peripheral nerves. These nerve conduction parameters may be affected by anthropometric factors like age, sex, height, weight, temperature and Body mass index. So during nerve conduction studies these factors should be taken into consideration. Majority of the available literature mentioning effects of age, height, Body mass index, temperature and gender on latency of nerve conduction measures have been referred in the present study.

**KEYWORDS:** Nerve conduction study, Latency, Physiological factors, Electrodiagnosis, Age, Gender, and Height were used.

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## **INTRODUCTION**

Nerve conduction study is a part of electro diagnostic procedure that helps in establishing the type and extent of abnormality of nerve<sup>6</sup>. It assesses peripheral motor and sensory functions by recording the evoked response to electrical stimulation of peripheral nerves<sup>10</sup>. These enable the clinicians to differentiate the two major groups of peripheral disease- demyelination and axonal degeneration. These also help in localizing site of lesion.<sup>10</sup>

Physiological factors such as age, temperature, height and gender are known to affect the NCV.<sup>29</sup> It is stated that fixing absolute thresholds without adjustments for age, sex, temperature and height may result in false positive and false negative results.<sup>29</sup> In human, investigators have reported different values for different physiological factors.<sup>29</sup> So, the following review is conducted to know how different factors affect the parameters of the nerve conduction study mainly the latency.

## **METHODOLOGY**

The articles were searched in Google scholar, Pubmed, Sciencedirect, and Research gate using the keywords nerve conduction study, latency, physiological factors, electro diagnosis, age, gender, height..The articles were taken from National Journal of Physiology, Pharmacy and Pharmacology, International Journal of Recent Advances in Multidisciplinary Research, International Journal of Research in Medical Sciences, Acta Neurologica Taiwanica, Journal of Clinical and Diagnostic Research, International Journal of Biomedical Research, International Journal of Health Sciences and Research and International Journal of Basic and Applied Physiology.

The articles included:

- Were published either in year 2000 or after that
- Included the effect of physiological factors on latency of nerve conduction study,
- Included effect of physiological factors on both motor and sensory nerves

Table 1 : Values of nerve conduction study

Author	Subject/sample Design	Protocol	Outcome	Result	Level of evidence
Krushan Yajnik, Balaji Ghogare, Mukesh Dinkar	Crosssectional study(51 healthy subjects)	All test were done on RMS Portable Aleron Electromyography machine	Recording of tibial motor nerve conduction velocity. Recording of peroneal motor nerve conduction study	Positive trend was observed in distal motor latency of Rt, tibial nerve with age.No association between BMI and nerve conduction study variables. There were NO statistically significant differences in values observed for males and females	II
Abhishek Kumar, Anjali Prasad	38 females and 80 males healthy subjects	All tests were done on JAVA RMS Aleron-201 series.	Motor nerve conduction study of Rt median nerve and Right tibial nerve were performed	AGE-Older subjects showed increase in motor latency for tibial nerve. Same for median nerve. GENDER-CMAP Latency was slightly increased in females in median nerve. Males had longer latency as compared to females in tibial nerve.	II
Thakur D Paudel BH , Jha CB	Cross sectional study -34 adults Younger n=18 Age(17-29)years Older n=16 Age(30-57)	All test were done using Digital Nihon Kohder machine	Motor nerve conduction study variables and sensory nerve conduction variables were recorded	CMAP latencies of right common peroneal were found to be smaller in older. SNAP latencies of left ulnar sensory nerve longer in older. None of the parameters of left radial, right and left sural nerves was found to be statistically significant.	II
Abhishek Kumar, Anjali Prasad	38 females and 80 males	All test were done on JAVA RMS aleron 201 series	Data of distal motor latency , motor nerve conduction study have been done	CMAP latencies were increased in male for median nerve.CMAP latencies for tibial nerve were increased in female compared to male.	II
OvaisKarnain Sheik imran Sayeed ,Surjit Singh BimalAg rawal MariyaR	100 males and 100 females	Equipment used was allengers Scorpio EMG EP NC system	Motor and sensory component of median and ulnar were performed	The distal motor latency for bilateral ulnar and median nerve increases with increasing age. The distal sensory latency for bilateral median and ulnar nerve increases with age.	II

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Wasim Bari Rahaha man, Mrinalka ntiGhosh , Arunima Chaudha ri	30 male and 30 female(age group- 18 to 60)	Equipment used NIHON KOHDEN NEUROPACK	Nerve conduction study variable of right and left tibial nerve is performed	Mean Values of Proximal and Distal motor Latency of median nerve were more in male than female and statistically highly significant. Distal mot or Latency were more in male than female in tibial nerve and the difference was highly significant	
YogitaDi lipSulax ane, Rahul Prakash Bhavsar	Cross sectional study (37 healthy subjects)	Equipment used was RMS EMG EP mark 2 machine	Sensory nerve conduction study was performed	Height showed positive correlation with latency of SNAP of ulnar, median and sural nerves	II
Thakur d Jha, pandey NK, Jha CB , Bajaj BK, Paudel BH	34 healthy individual	Equipment used was Nihon Kohden machine	Motor nerve conduction study and sensory nerve conduction study was performed	Positive correlation of height with CMAP latencies with all nerves with exception of ulnar and right radial nerve. SNAP latencies showed positive correlation with height.No significant parameters of left radial and leftsural nerve was found to be statistically significant.	II
ShailjaTi wari, Kiran Patel, Namrata Dubey	60 students Age(17-25 years)	Equipment used was RMS aleron 201 EMG and NCV	Nerve conduction parameters of both motor and sensory bilaterally was performed	Temperature gradually decreased from 37 degree C to 29 degree C. latency of median motor and sensory increased by 0.18 to 0.24 milisec/degree C decrease in temperature	II
S. Saeed, M. Akram	Simple random sampling -25 normal adults(age 40-70 years)	Equipment used was electromyography by Nihon kohden MEB 5304 K	Sural nerve conduction study was performed.	Sensory latency of sural nerve exhibited insignificant direct correlation with age. Sensory latency of sural nerve increases with increasing height. It showed direct relation of sensory latency of suralnerve with BMI.	II
Henry C. Tong,	Cross sectional study (501 study)		Median and ulnar nerve conduction study was	Changes in median and ulnar latency	II

Robert A. Werner, and Alfred Franzblau			done	were not affected by gender, height, age or BMI.	
William J. Hennessy, Frank J.E. Falco, Gary Goldberg, MD, Randall L. Braddom	44 subjects (age 19 -43 years)	Equipment used was TECA Neurostar EMG	Motor and sensory nerve conduction study for ulnar, median and radial nerves was performed.	No influence was noted for distal latency of ulnar and median nerve. Sensory latency are not believed to be clinically significant according to study in relation to arm length. Gender has great effect on median sensory latency. Other median motor and sensory parameters along with radial sensory latency were not significant to gender.	II
Sachin M. Pawar, Avinash B. Taksand e and Ranji Singh	175 subjects (age 18-66 years)	Equipment used was RMS EMG EP Mark-II	Motor nerve tested were Median, Ulnar, Peroneal, Tibial and sensory study was done on Median, Ulnar and Sural nerve	Prolongation of distal motor latency was observed in median , ulnar, radial , tibialwith increasing BMI except in motor peroneal nerve.	II
Samol S, Hui M, Parmar D, Dixit R	50 males and 50 females	A NEUROSTIM EMG/NCV/EP machine	Motor and sensory component of median and ulnar nerve were recorded.	Mean distal latency of motor ulnar and median nerves were more in males. Mean distal latency of sensory ulnar and motor nerve were also more in males.	II
Gakhar , M., Verma , S.K. and Lehri , A.	70 subjects (35 males and 35 females)	Equipment used was NEUROPERFECT 2000 machine	The motor and sensory evaluations were performed on the ulnar and the median nerves.	Motor latency of median nerve is longer in males than females. Sensory latency period of median nerve is observed to be longer in males than the females	II

## CONCLUSION

- Effect of age on latency

It can be concluded that there is strong evidence supporting that as age increases motor latency of median, ulnar, and tibial nerve increases. There is insufficient evidence about the effect of age on radial and peroneal nerve.

- Effect of gender on latency

There is strong evidence that motor latency of median, ulnar and tibial nerves are longer in male compared to female. There is also significant change observed in sensory latency of median and ulnar nerves in response to gender showing more in males compared to females. There is no evidence of effect of gender on radial, peroneal and sural nerves.

- Effect of height on latency

There is weak evidence supporting the effect of height on motor and sensory latency of median, ulnar, tibial and peroneal nerve suggestive positive correlation with height. There is no evidence for effect of height on radial and sural nerves.

- Effect of BMI on latency

There is insufficient evidence about the effect of BMI on motor and sensory latency showing there is prolongation of latency with increasing BMI in median, ulnar, radial, and tibial except peroneal nerves.

- Effect of temperature on latency

There is insufficient evidence about the effect of temperature on motor and sensory latency showing that latency increases with decrease in temperature.

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