Journal of Exercise Science & Physiotherapy Volume 22 No.2 (July - December) 2026
I2OR Impact Factor = 7.860 ISSN: 0973-2020 (Print) ISSN: 2454-6089 (Online)

JOURNAL OF EXERCISE SCIENCE AND PHYSIOTHERAPY
Indexed, Peer Reviewed, Referred
Since 2005

Immediate Effect of Lumbopelvic Correction Techniques on Tibial Nerve Parameters in Healthy Individuals

Amit and Suman Rani

Abstract

Background: Lumbopelvic is a specific instance of coordinated, simultaneous activity lumbar flexion and anterior pelvic tilting during trunk flexion and extension. The mechanism of spinal manipulation is theorized to be mediated by the nervous system. The question lies in how a very quick, dynamic, mechanical thrust could change the sensory output to the nervous system. **Materials and Methods**: The study was a single group pre- test and post- test study including 100 subjects who fulfill the inclusive and exclusive criteria with simple random sampling. Pre and Post NCV of right and left tibial nerve were taken along with giving lumbopelvic manipulation. **Results**: The results showed that a single session of lumbopelvic manipulation significantly improved tibial nerve conduction velocity. Post-intervention the nerve conduction velocity increased on both sides (Right CV = 51.05 ± 6.08 m/s; Left CV = 49.85 ± 6.12 m/s) compared to pre-intervention values (Right CV = 47.00 ± 4.87 m/s; Left CV = 46.73 ± 7.41 m/s). Although amplitude values showed improvement following intervention but the changes were not statistically significant. **Conclusion**: This study concluded that there is considerably significant improvement in the conduction velocity of the tibial nerve when lumbopelvic manipulation was given in healthy individuals.

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Key words: Lumbopelvic, spinal manipulation, NCV, healthy individuals

DOI: 10.18376/jesp/2026/v22/i2/47768

Introduction

Lumbopelvic is a specific instance of coordinated, simultaneous activity lumbar flexion and anterior pelvic tilting during trunk flexion and extension. It is a combination of lumbar and pelvic movements (Cailliet 1966). The lumbopelvic part consists of 13 to 15 vertebras. The 5 lumbar vertebrae are regarded as the true or movable vertebrae, but the 5 sacral and 3 to 5 coccygeal vertebrae are referred to as the false or fixed vertebrae because they merge to produce the 2 adult bones of the sacrum and coccyx (Hodges and Richardson 1996). Incontinence, SI joint discomfort and other (LPD) lumbopelvic region dysfunction, such as LBP, are quite prevalent in today's culture. One of the major risk factor for these conditions is an unhealthy weight and sedentary lifestyle (Lee 2004). Lumbopelvic movement and posture are an essential part of the physical examination of individuals with low back pain (LBP), in part because clinicians frequently hold the opinion that spotting and treating movement/postural abnormalities will reduce pain and activity limitation. Basic kinematic evaluations, such as ROM and posture are frequently included in the examination of lumbopelvic movement. Higher level kinematics may also be present, including: Temporal and spatial patterns during physiological movements, proprioception, patterns of muscle activation,Complex functional actions like lifting or walking are examples of postural sway (O'Sullivan 2005). Lumbopelvic stability is the capacity to keep the lumbopelvic region steady while moving the limbs (Vasseljen et al., 2012). Reduced lumbopelvic stability results in incorrect spinal movement during limb movement, and the incorrect movement may irritate the nearby joint mechanically (Sahrmann et al., 2017). An examination known as NCS is frequently used to gauge how well the body's motor and sensory nerves are functioning (Weiss and Silver 2004). Peripheral nerves are most commonly used to measure nerve conduction velocities (NCV). Electro diagnostic assessment of peripheral nerve includes two major components: Nerve conduction study (NCS) and needle electromyography (EMG) (Mishra and Kalita 1999). It is used to evaluate the functional ability of electrical conduction of the motor and sensory nerves of the human body. NCV is a common measurement made during the test, which measures how quickly electrical impulse travel along a nerve. It is to be done at the same time as an EMG, to exclude or detect muscular disorder (Kumar and Prasad 1970). Spinal manipulation involves a high velocity, low amplitude thrust applied to the spine. This is believed to cause therapeutic effects such as reduction in pain, restore normal ROM and return the neuromuscular skeletal system to normal. The mechanism of spinal manipulation is theorized to be mediated by the nervous system. The question lies in how a very quick, dynamic, mechanical thrust could change the sensory output to the nervous system (Pickar 2002).

Materials and Method

The present study was conducted on one hundred (N=100) subjects. The study design was a single group pre- test post- test study and the sampling technique was a simple random sampling. The study was conducted at Department of Physiotherapy, BMU, Asthal Bohar, Rohtak. The subjects were healthy both males and females and their age ranged 18-30 years. All the procedure and information such as benefits and need of this study were explained to the participants. The data was collected on the basis of participants reports. Demographic and health-related information was collected from each participant including age, gender etc. Informed consent was obtained from the individual. The subjects were questioned about any implanted device and requested to remove any wearing jewellery. Subjects were fully informed that they would feel a small electric current with stimulator in this procedure. Pre and Post NCV of right and left tibial nerve were taken along with giving lumbopelvic manipulation.

MNCV was calculated by using formula: Conduction velocity=PL−DLDm/s (Pal 2011)

Where, PL = proximal latency (lat 2); DL= distal latency (lat 1); D = distance (mm) between two stimulating points.

Recording Procedure - The Knee-ankle segment of tibial nerve was tested. At the popliteal fossa and ankle, the tibial nerve was stimulated with supra maximum stimuli, and surface electrodes were used to capture the CMAP from the abductor hallucis brevis muscle.

Position **-** The MNCV procedure was performed while subject was in the supine position**.**

Active Electrodes (A) – The active electrode was placed above the medial foot at the highest point of the arch generated by the intersection of the plantar skin and dorsal foot skin, somewhat anterior and inferior to the navicular tubercle**.**

Reference Electrode (R) – The reference electrode was p[laced on the medial surface of the first metacarpophalangeal joint, placement was slightly distal to the joint.

Ground Electrode (G) - The ground electrode was placed on the dorsum.

Stimulation Point (S1) - The cathode was positioned 8 cm in front of the active electrode, just posterior to the medial malleolus (measured in a straight line with the ankle in the middle). The foot was close to the anode.

Stimulation Point (S2) - The cathode was positioned near the midpoint of the popliteal fossa or just medially or laterally of the midline, proximal to the anode.
Nerve Fibre Tested -S1 and S2 nerve roots through the anterior division of the lumbosacral plexus and the sciatic nerve. (where, A - Active Electrode, R – Reference Electrode, G – Ground Electrode, S1 – Distal Stimulation Site, S2 – Proximal Stimulation Sites, C – Cathode, A – Anode)
Machine Setting - Sensitivity-5mv/division, low frequency filter-20Hz, high frequency filter=3 kHz and sweep speed- 3msec/division.
Precautions Applied

- The subject has received the appropriate training and was motivated to offer their complete cooperation.
- The subject was securely grounded.
- The subject was completely relaxed.
- The test portion was thoroughly wiped with spirit to remove any perspiration**.**

Posterior Innominate Technique - Recommended by Mintken et al., (2008) a high velocity end range rotation thrust to the lumbopelvic region, pelvis on lumbar spine with patient supine.
Lumbar rotation in neutral or extension manipulation
Patient position: Side-lying
Therapist position: Standing in front of the patient's hips
Procedure: The patient was lying on his or her right side, and the therapist positioned the right leg in a straight line to achieve neutral or extension while the left hip was flexed to around 60^0 degrees so that the left knee was 90^0 flexed and the left foot's dorsum can be placed directly behind the right knee. The therapist started by rotating the upper body to the desired level to the left before applying an axillary hold with the left hand and forearm**.** Standing close to the couch, the therapist maintained an upright posture while facing the patient's upper body. Then, he or she rotated the pelvis and lumbar spine in the direction of the patient until the motion was felt at the desired segment by placing the right hand or forearm in the area between the gluteus medius and maximus (pre-tension). Exaggerated pelvic rotation was used to apply the push with the right hand against the pelvis and in the downward direction toward the couch. And the left hand just helped to stabilise the axilla.

Results

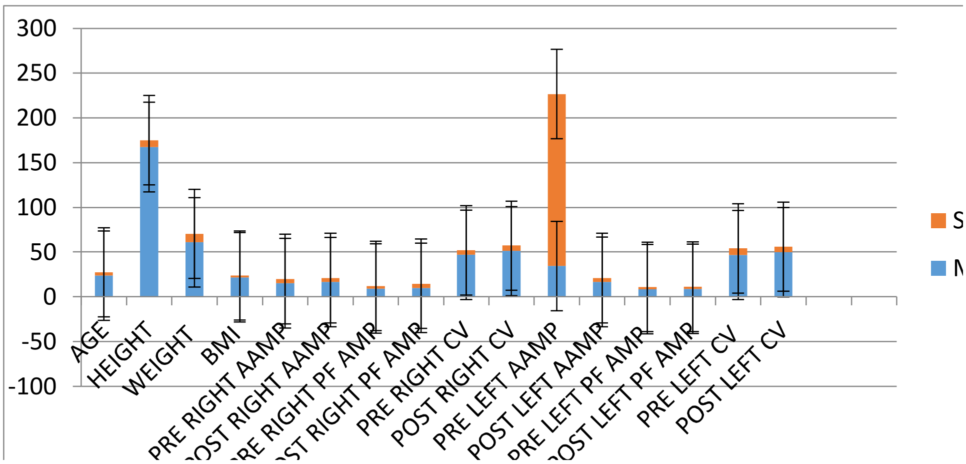

Figure 1. Mean ±SD of Characteristics of different variables

The mean age, height, weight and body mass index (BMI) was 23.76 ± 3.64 , 167.39 ± 7.71, 60.86 ± 9.48 and 21.62 ± 2.16. The mean Pre Right AAMP, Post Right AAMP, Pre Right PF AMP, and

Post Right PF AMP was 15.02 ± 4.75 , 16.36 ± 4.43, 9.17 ± 2.80 and 9.85 ± 4.68. The mean Pre Right CV and Post Right CV was 47.00 ± 4.87 and 51.05 ± 6.08. The mean Pre Left AAMP, Post Left AAMP, Pre Left PF AMP and Post Left PF AMP was 34.33 ± 2.35, 16.56 ± 4.16, 8.40 ± 2.55 and 8.74 ± 2.35. The mean Pre Left CV and Post Left CV was 46.73 ± 7.41 and 49.85 ± 6.12 (Table 1 and Figure 1).

Table 1. Mean ±SD of Characteristics of different variables

Variables	**Mean ± SD**
Age	23.76 ± 3.64
Height	167.39 ± 7.71
Weight	60.86 ± 9.48
BMI	21.62 ± 2.16
Pre Right AAMP	15.02 ± 4.75
Post Right AAMP	16.36 ± 4.43
Pre Right PF AMP	9.17 ± 2.80
Post Right PF AMP	9.85 ± 4.68
Pre Right CV	47.00 ± 4.87
Post Right CV	51.05 ± 6.08
Pre Left AAMP	34.33 ± 2.35
Post Left AAMP	16.56 ± 4.16
Pre Left PF AMP	8.40 ± 2.55
Post Left PF AMP	8.74 ± 2.35
Pre Left CV	46.73 ± 7.41
Post Left CV	49.85 ± 6.12

Table 2 and Figure 2 shows a statistically significant improvement in post intervention scores of Right AAMP in comparison with pre intervention scores.

Table 2. Paired t-test between pre and post Right AAMP

Variables	**Pre Intervention Mean ± SD**	**Post Intervention Mean ± SD**	**P-value**
Right AAMP	15.02 ± 4.75	16.36 ± 4.43	0.013

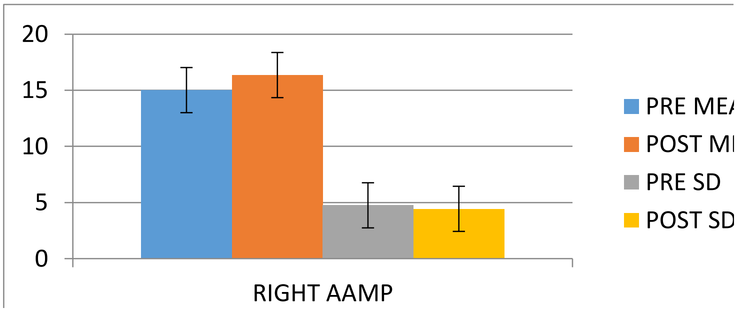

Figure 2. Paired t-test between pre and post Right AAMP

Table 3. Paired t-test between pre and post Left AAMP

Variables	Pre Intervention Mean ± SD	Post Intervention Mean ± SD	P-value
Left AAMP	34.33 ± 2.35	16.56 ± 4.16	0.356

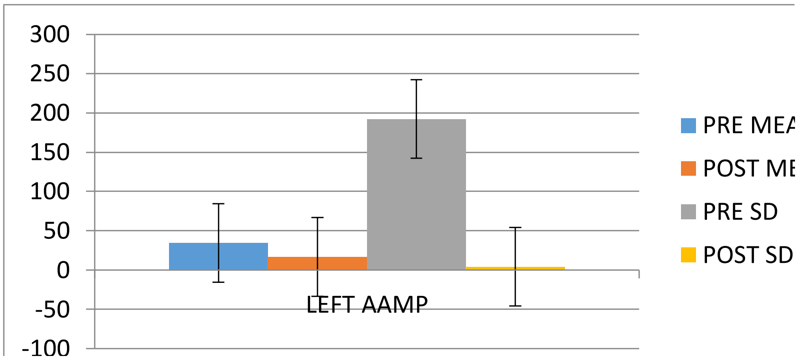

Figure 3. Paired t-test between pre and post Left AAMP

Table 3 and Figure 3 shows an increase in post intervention scores of Left AAMP compared to pre intervention scores; however, the difference was not statistically significant ($p = 0.356$).

Table 4. Paired t-test between pre and post Right PF AMP

Variables	Pre Value Mean ± SD	Post Value Mean ± SD	P-value
Right PF AMP	9.17 ± 2.80	9.85 ± 4.68	0.205

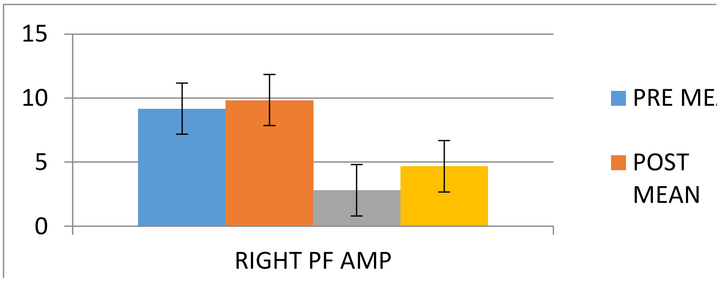

Figure 4. Paired t-test between pre and post Right PF AMP

Table 4 and Figure 4 shows an increase in post intervention scores of Right PF AMP compared to pre intervention scores; however, the difference was not statistically significant (p = 0.205).

Table 5. Paired t-test between pre and post left PFAMP

Variables	Pre Value Mean ± SD	Post Value Mean ± SD	P-value
Left PF AMP	8.40 ± 2.55	8.74 ± 2.35	0.356

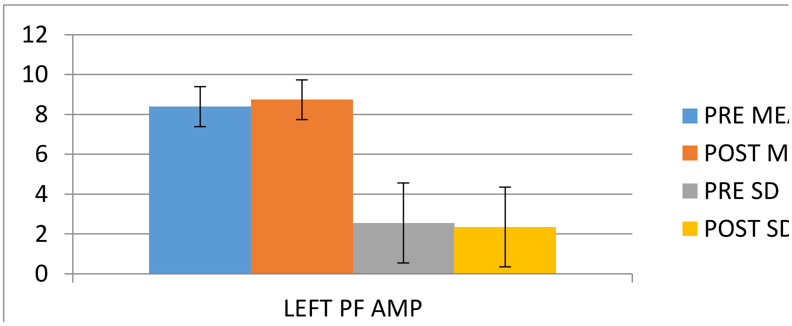

Figure 5. Paired t-test between pre and post left PFAMP

Table 5 and Figure 5 shows an increase in post intervention scores of Left PF AMP compared to pre intervention scores; however, the difference was not statistically significant (p = 0.356).

Table 6. Paired t-test between pre and post Right CV

Variables	Pre Value Mean ± SD	Post Value Mean ± SD	P-value
Right CV	47.00 ± 4.87	51.05 ± 6.08	0.01

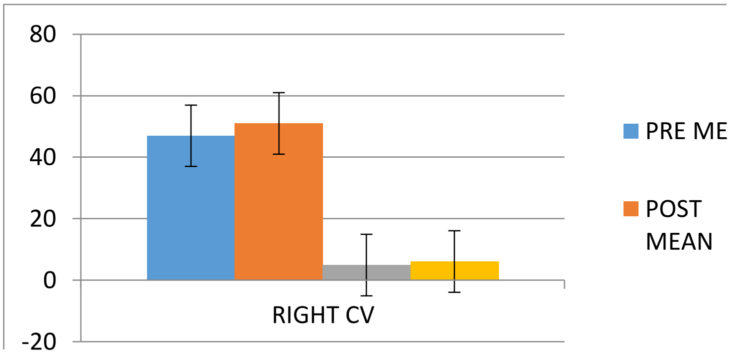

Figure 6. Paired t-test between pre and post Right CV

Table 6 and Figure 6 Shows a stastically significant improvement in post intervention scores of Right CV in comparison with pre intervention scores

Table 7. Paired t-test between pre and post Left CV

Variables	Pre Value Mean ± SD	Post Value Mean ± SD	P-value
Left CV	46.73 ± 7.41	49.85 ± 6.12	0.01

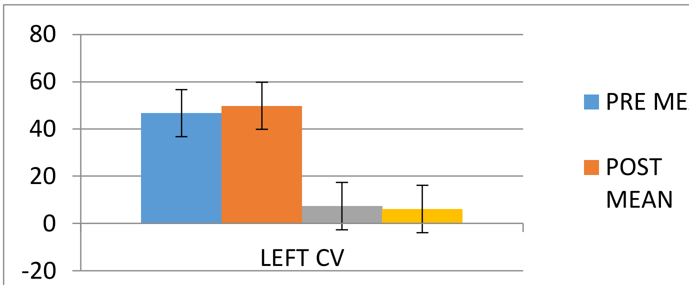

Figure 7. Paired t-test between pre and post Left CV

Table 7and Figure 7 shows a stastically significant improvement in post intervention scores of left CV in comparison with pre intervention scores.

Discussion

The aim of study was to investigate the efficacy of Lumbopelvic manipulation in tibial NCV in healthy individuals. To the best of our knowledge, we did not find any study related to Comparison of efficacy of Lumbopelvic manipulation in tibial nerve conduction velocity in healthy individuals.

Our experimental hypothesis is found effective because spinal manipulation alters central sensory processing by removing sub threshold mechanical or chemical stimuli from paraspinal tissues. It also affects reflex neural outputs to both muscle and visceral organs and evokes paraspinal muscle reflexes and alters motor neuron excitability. These somatosomatic reflexes may be quite complex, producing excitatory and inhibitory effects (Pickar 2002). According to Herzog' et al., posterior to anterior spinal manipulative treatments applied to the cervical, thoracic lumbar and sacroiliac regions increased paraspinal EMG activity in a pattern related to the region of the spine that was manipulated in healthy individuals. The EMG response latencies occur within 50 to 200 ms after initiation of the manipulation. The results of the present study showed that the single session of LPM shows significant improvement in the NCV without causing any discomfort. We found Post intervention tibial nerve right and left conduction Velocity increased (Right Post CV MD = 51.05, Left Post CV MD = 49.58), as compared to Pre intervention conduction velocity (Right Pre CV MD = 47, Left Pre CV MD = 46.73). Post intervention amplitude values of the right and left ankle and popliteal fossa showed improvement following intervention; however, these changes were not statistically significant. The results of the present study are consistent to Lindeque (2018) who found that the single session of cervical manipulation on nerve conduction velocity in sub-acute mechanical neck pain causes an immediate increase in time (lat) for the nerve impulses to travel along the nerve.

Motealleh et al., (2020) did a study on the "immediate effect of lumbopelvic manipulation on knee pain, knee joint position sense, and balance in patients with patellofemoral pain" study included the 44 patients with PFP participated and that were randomly assigned into 2 groups. In a single session, one group received LPM while the other received sham LPM (positioning without thrust). Immediately following the intervention, there was a statistically significant improvement in pain, balance control (anterior direction), and JPS in the LPM group. Additionally, there was a significant change between the groups right after the intervention in pain, balance control (in the anterior direction), and JPS at 60 degrees of knee flexion. The study also concluded that the patients with patellofemoral discomfort experienced instant pain relief after just one session of lumbar and pelvic manipulation.

Grindstaff et al., (2009) did a study on "Effects of lumbopelvic joint manipulation on quadriceps activation and strength in healthy individuals" they included the 42 individuals and they were randomly assigned into 3 groups (lumbopelvic joint, LPM, lumbar passive ROM for 1 min, or prone extension on elbows for 3 min). During a sitting isometric knee extension exercise, quadriceps force and activation were assessed using the burst-superimposition technique before and at 0, 20, 40, and 60 min after intervention. Collectively, all groups showed a significant reduction in quadriceps force output ($P < 0.001$) without changes in activation ($p > 0.05$). The quadriceps force and activation in the group that underwent a lumbopelvic joint manipulation significantly increased ($P<0.05$) after the intervention, however this effect disappeared after a 20-minute interval.

Conclusion

The study concluded that a single session of lumbopelvic manipulation significantly improved tibial nerve conduction velocity in healthy individuals. However, no statistically significant changes were observed in tibial nerve amplitude parameters.

Hence, the null hypothesis was rejected, and the alternative hypothesis was accepted, indicating that lumbopelvic manipulation has a significant effect on improving tibial nerve conduction velocity in healthy individuals

References

Cailliet R. Soft tissue pain and disability. (ed.3) . Philadelphia F.A. Davis, 1966.

Grindstaff TL, Hertel J, Beazell JR, Magrum EM, Ingersoll CD. Effects of lumbopelvic joint manipulation on quadriceps activation and strength in healthy individuals. Manual therapy. 2009 Aug 1;14(4):415-20.

Hodges, P. W., & Richardson, C. A. (1996). Inefficient muscular stabilization of the lumbar spine associated with low back pain. A motor control evaluation of transversus abdominis. Spine, 21(22),2640–2650.

Kumar A, and Prasad A. Nerve conduction velocity in median nerve and tibial nerve of healthy adult population with respect to gender. National Journal of Physiology, Pharmacy and Pharmacology. 1970 Jan 1;6(5):368.

Lee D (2004) The Pelvic Girdle: An approach to the examination and treatment of the lumbo-pelvic-hip region. (3rd edn), Churchill Livingstone, Edinburgh, UK.

Lindeque DL. *The immediate effect of cervical manipulation on nerve conduction velocity in sub-acute mechanical neck pain.* Master's Dissertation. University of Johannesburg; 2018.

Mintken PE, DeRosa C, Little T, Smith B. A model for standardizing manipulation terminology in physical therapy practice. journal of orthopaedic & sports physical therapy. 2008 Mar;38(3):A1-6.

Mishra UK, and Kalita J. Clinical Neurophysiology – Nerve Conduction, Electromyography and Evoked Potentials. 2nd ed. New Delhi: BI Churchill Livingstone; 1999.

Motealleh A, Barzegar A, Abbasi L. The immediate effect of lumbopelvic manipulation on knee pain, knee position sense, and balance in patients with patellofemoral pain: A randomized controlled trial. Journal of Bodywork and Movement Therapies. 2020 Jul 1;24(3):71-7.

O'Sullivan P. (2005). Diagnosis and classification of chronic low back pain disorders: maladaptive movement and motor control impairments as underlying mechanism. Manual therapy, 10(4), 242–255.

Pal GK. Textbook of Practical Physiology. 3rd ed. Chennai: Orient Blackswan; 2011.

Pickar J. G. (2002). Neurophysiological effects of spinal manipulation. The spine journal: official journal of the North American Spine Society, 2(5), 357–371.

Sahrmann, S., Azevedo, D. C., & Dillen, L. V. (2017). Diagnosis and treatment of movement system impairment syndromes. Brazilian journal of physical therapy, 21(6), 391–399.

Vasseljen, O., Unsgaard-Tøndel, M., Westad, C., & Mork, P. J. (2012). Effect of core stability exercises on feed-forward activation of deep abdominal muscles in chronic low back pain: a randomized controlled trial. Spine, 37(13), 1101–1108.

Weiss, J., & Silver, J.K. (2004). Easy EMG: A Guide to Performing Nerve Conduction Studies and Electromyography.

Conflict of Interest: None declared