

Studies on Vibration frequency of Nerve Plate compared to other vibration plates.

Physiol Meas. 2020 Mar 6;41(2):025004.

Wavelet-based analysis of plantar skin blood flow response to different frequencies of local vibration

Ting Zhu¹, Yana Wang¹, Jieying Yang¹, Fuyuan Liao², Shaobai Wang³, Yih-Kuen Jan^{1,4,5,6}

Affiliations [Expand](#)

Abstract

Objective: The objectives of this study were to investigate the response of plantar skin blood flow (SBF) to different frequencies of local vibration (LV) and investigate the mechanisms of blood flow control in response to the different frequencies of LV using wavelet analysis.

Approach: Twelve healthy participants were recruited to test the effects of three frequencies [0 Hz (sham control), 35 Hz and 100 Hz at 1 mm amplitude] of 10 min LV on the skin of the right first metatarsal head. A repeated measures design was used in this study and the order of vibration frequencies was randomly assigned to participants while they lay on a mat table. Laser Doppler flowmetry was used to measure SBF on the first metatarsal head before and after LV for 10 min. SBF after vibration was expressed as a ratio of SBF before vibration. Wavelet analysis was used to characterize changes in SBF control mechanisms.

Main results: Our results showed that the SBF with the 100 Hz protocol (1.56 ± 0.19) was significantly higher than for the 35 Hz (1.29 ± 0.18 , $p < 0.05$) and 0 Hz (0.85 ± 0.11 , $p < 0.01$) protocols. Wavelet analysis demonstrated that metabolic endothelial control (SBF oscillations of 0.0095-0.02 Hz) and neurogenic control (SBF oscillations of 0.02-0.05 Hz) were associated with the increase in SBF after LV at 100 Hz.

Significance: LV at 100 Hz results in a significant increase in SBF compared with 35 Hz and 0 Hz vibrations. Such an increase in SBF is related to the regulation of metabolic endothelial (0.0095-0.02 Hz) and neurogenic (0.02-0.05 Hz) controls. This is the first study to demonstrate that 100 Hz LV stimulates an increase in plantar SBF compared with 35 Hz and 0 Hz vibrations through the frequency intervals of 0.0095-0.02 and 0.02-0.05 Hz of SBF oscillations.

Front Bioeng Biotechnol 2019 Nov 5:7:310.

[See other side](#)

Effects of Local Vibration With Different Intermittent Durations on Skin Blood Flow Responses in Diabetic People

[Weiyan Ren](#)¹, [Fang Pu](#)^{2,3}, [Huqin Luan](#)¹, [Yijie Duan](#)², [Honglun Su](#)¹, [Yubo Fan](#)^{1,2,3}, [Yih-Kuen Jan](#)^{3,4}

Affiliations Expand

Abstract

Objective: Poor blood flow supply is an important pathological factor that leads to the development and deterioration of diabetic foot ulcers. This study aims to investigate the acute effects of local vibration with varying intermittent durations on the plantar skin blood flow (SBF) response in diabetic and healthy subjects.

Methods: Eleven diabetic patients (7 males, 4 females) and 15 healthy adults (6 males, 9 females) participated in this experiment and accepted three tests. Local continuous vibration (LCV) and two levels of local intermittent vibration (LIV1 and LIV2) *[as seen in the Nerve plate]* were randomly applied to the middle metatarsal head of each subject's right foot in each test. The SBF was measured prior to intervention (Baseline), during Vibration and during the Recovery Stage for each test. The mean SBF in each stage, the change percentages and change rates of SBF in Vibration and Recovery stage among three tests were compared and analyzed for both diabetic and healthy subjects.

Results: For diabetic subjects, the SBF was significantly increased in both Vibration and Recovery Stage with local intermittent vibrations (LIV1 and LIV2), but not with LCV. However, there was no significant difference in change percentage and change rate of SBF in diabetic subjects across the three tests. For healthy subjects, all vibration interventions significantly increased the SBF in the Vibration Stage and in the first 1.5 min of the Recovery Stage. Also, the change rate of SBF during the Vibration stage in LIV1 test was significantly greater than that in LIV2 test for healthy subjects. Moreover, change percentage of SBF in Vibration stage of LIV1 test and in some periods of Recovery stages of LIV1 and LIV2 tests for diabetic subjects were lower than for healthy subjects; the absolute change rate of SBF in LIV1 test for diabetic subjects was also lower than for healthy subjects.

Conclusion: These findings suggest that both **LIV1 and LIV2 may effectively improve SBF in the feet of diabetic people, but LCV may not achieve the same level of vasodilatation.** The diabetic subjects were also found to have a lower SBF response to applied vibration than the healthy subjects.

See other side