



The Effects of Vibrations on the Light Touch Perception Threshold of Transtibial Amputees

Aaron Robinson¹, Jenny Kent¹, Shane R. Wurdeman², Adam L. Jacobsen³, Nicolas Stergiou^{1,4}, Kota Z. Takahashi¹

¹Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE 68182

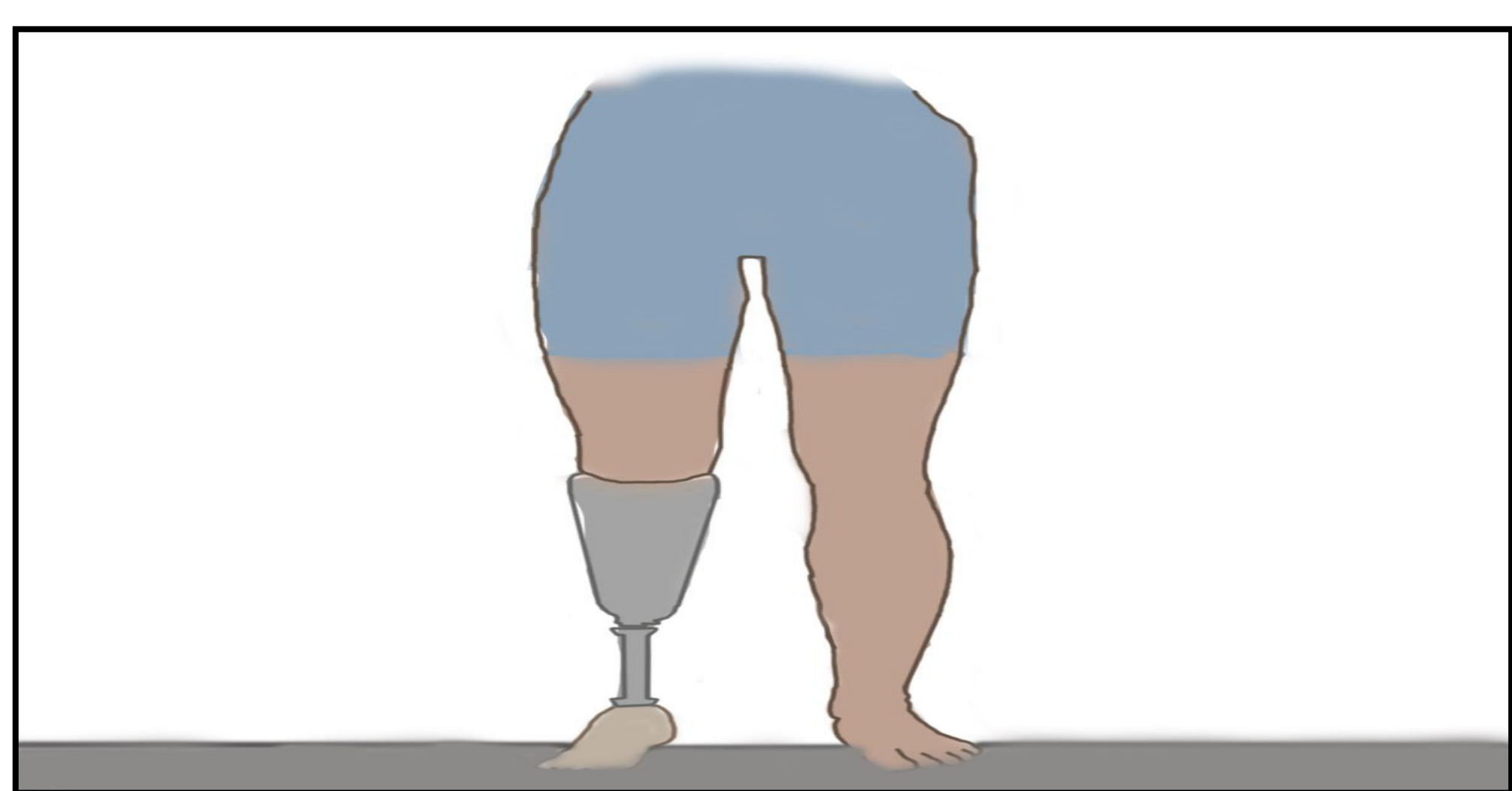
²Department of Clinical and Scientific Affairs, Hanger Clinic, Houston, TX USA

³Veterans Affairs Medical Center, Omaha, NE USA

⁴College of Public Health, University of Nebraska Medical Center, Omaha, NE USA

Introduction

Sensations deriving from the residual limb and the prosthetic socket interface may be important for mobility/balance following an amputation. One potential way to improve sensation in the residual limb-socket interface is the use of sub-threshold vibrations.



Purpose: To determine whether the use of sub-threshold vibrations can improve light touch sensation in transtibial amputees.

Hypothesis: The application of a sub-threshold pink noise vibration will improve an amputee's ability to perceive a light touch stimulus in the residual limb surrounding the area of amputation.

Methods

Groups	Total	Gender	Age(yrs)	Height(m)	Weight(kg)
Unilateral Transtibial Amputee	20	F=4 M=16	59.7±15	1.79±.06	100.2±15.9
Healthy Control	17	F=4 M=13	54.1±16	1.72±.09	85.5±18.8

Conditions

- 1) No vibration
- 2) White noise vibration
- 3) Pink noise vibration



The baseline and the three conditions were administered to the mid-thigh of the residual limb by a vibrating factor.

Acknowledgements

This work was supported by NIH P20GM109090 and NIH R15HD08682.

Methods



Monofilaments

Varied from a diameter of 1.65mm to 6.65mm.

Diameter of 5.07 = protective sensory threshold².

Results

The light touch sensation threshold was significantly greater in amputees than healthy controls ($p < 0.001$).

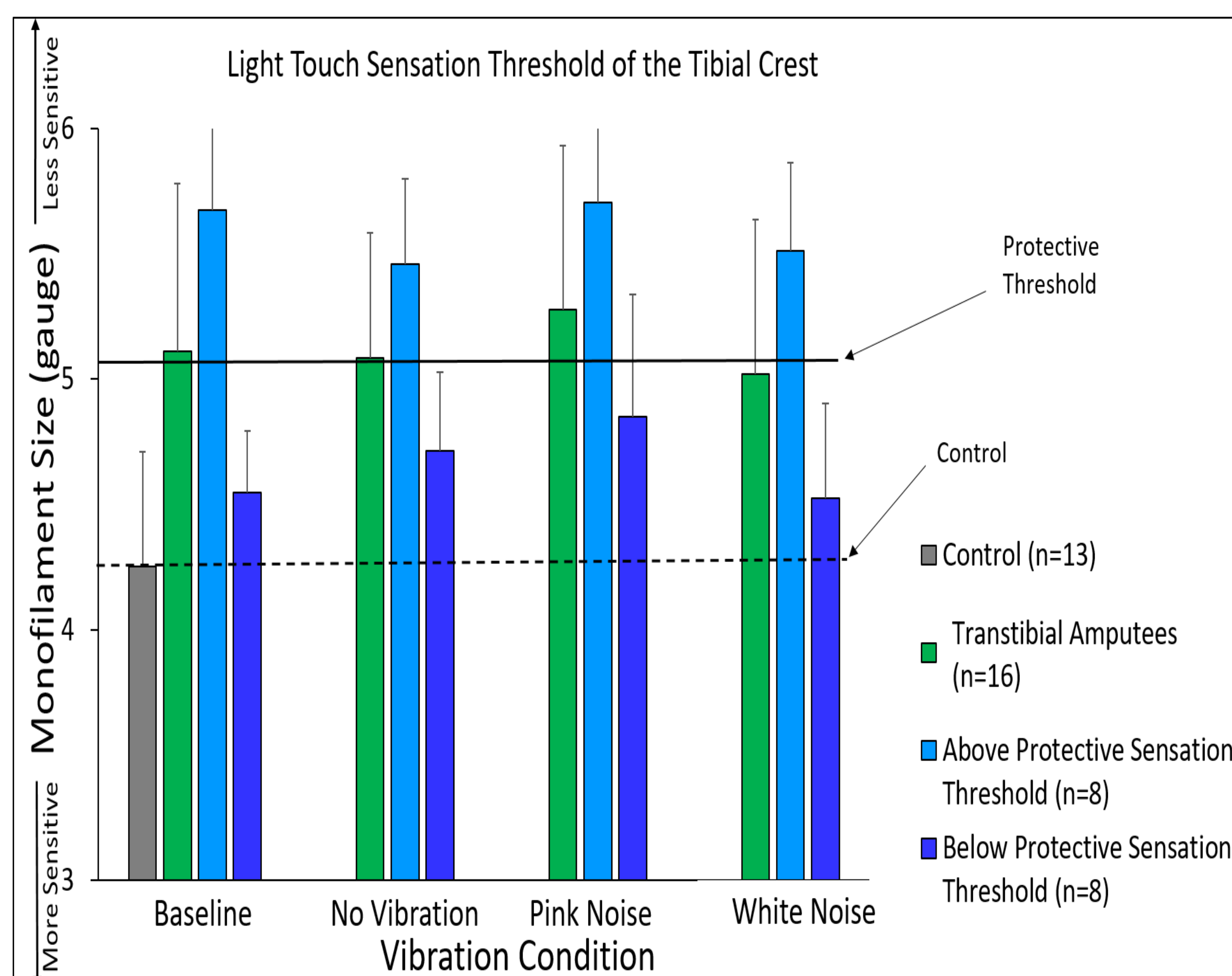


Figure 1: The application of vibrations (White and Pink Noise) had no significant effect on the perception of light touch in the residual limb (tibial crest) of individual with transtibial amputation ($p = 0.44$).

Discussion

Our hypothesis was not supported, even though some interesting trends were present especially for the below protective sensation threshold amputees. We are currently testing whether sub-threshold vibrations can improve other functions, such as walking and standing using biomechanical analyses

References

1. Galica, A.M., et al. (2009) *Gait & Posture*, 30(3), 383
2. Wang, Fengyi, et al. (2017) *J Diabetes Res*, 1–12.