

## Product Design Specifications

### Tactile Stimulator

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#### Problem Statement

Falling from ladders or scaffolds is of the leading causes of workplace injuries and fatalities. A device must be developed to improve the workers' response time by stimulating their sense of touch through vibrations in their hands. The device must be MR-compatible in order to analyze brain activity during the stimulus to the hand. The overall goal is to prove that a continuous stimulus on the hand can improve the range of sensory frequency perception.

#### Client Requirements

- The device must reduce the 60 ms lag time between stimulus and reaction
- Does not obstruct the user's grip while holding onto a ladder or scaffold
- Small enough to fit on the palmar side of the user's fingers
- MR-compatibility for testing purposes
- The frequency must be randomly changing, and operate between 30-300 Hz

#### Design Requirements

##### 1. Physical and Operational Characteristics

- Stimulation:* The device must stimulate the Pacinian corpuscle, with a randomly changing frequency of 30-300 Hz.
- Size:* Stimulators on the palmar side of the hand cannot exceed 1 mm in thickness; stimulators on the dorsal side of the hand should not exceed 2 mm thickness. The minimum diameter of the stimulator is 2 cm.
- Operating environment:* The device must function in a Magnetic Resonance Imager in order to analyze brain activity during stimulus.
- Versatility:* Must accommodate a range of hand sizes. Also should be easily sterilized for repeated use.
- Sensitivity:* The patient must not consciously feel the vibrations, and the device must accommodate a range of nerve sensitivities in patients.
- Life in Service:* The device should remain fully functional for a minimum of one year under normal work conditions.

##### 2. Production Characteristics

- Quantity:* One working prototype (for a single hand) must be fabricated for MRI testing purposes.
- Target Production Cost:* (Will establish with client after creating list of parts needed.)

##### 3. Miscellaneous

- Customer:* Researchers observing the effects of vibration stimuli to the hand.
- Competition:* None.