



Industry:

- Neuromodulation
- Healthy Aging

Team Background: Our team has worked together for six years using brain-machine-interfaces, behavioral paradigms, and computational modelling to investigate how neuromodulatory systems affect the processing and resulting perception of sensory stimuli.

Management:

Charles Rodenkirch, PhD

- Biomedical Engineer and Systems/Computational Neuroscientist
- Experienced with technology transfer from working for Columbia Technology Ventures
- Second-time Entrepreneur

Qi Wang, PhD

- Holds Doctorates in Electrical Engineering and Robotics
- Assistant Professor of Biomedical Engineering at Columbia University
- Head of Neural Engineering Lab

Informal Scientific Advisory Board:

Jason Carmel, MD, PhD

- Assistant Professor of Pediatric Neurology at Columbia University
- Expert in neural stimulation and sensorimotor neural circuitry

Incorporation:

Delaware C-Corp by WSGR (3/2020)

Intellectual Property: Columbia Technology Ventures (CTV) filed a provisional patent application (6/2019) and will file US and PCT patent applications (by 6/2020). Sharper Sense has an exclusive option to negotiate a license agreement with CTV until 5/2022.

Funding Sought: Sharper Sense is seeking \$300,000 that will be used to conduct pilot clinical studies that will provide a proof of concept our technology can be used to reduce the likelihood of tactile, auditory, and visual misperception for elderly individuals suffering from age-related sensory loss.

Sharper Sense is developing wearable neuromodulation technology that can enhance perceptual acuity and reduce the probability of tactile, visual, and auditory misperception.

Problem/Opportunity: The accuracy of perceived details in visual, auditory, and tactile stimuli heavily affects performance on tasks required for independent living, employment, and recreation. Unfortunately, many factors can degrade sensory acuity including aging, fatigue, injury, and multiple neurological disorders. Sensory loss can cause communication breakdown and stress in relationships. Age-related sensory loss accelerates cognitive decline and increases risk of serious accidents, such as falls. The combined effects of sensory loss are so disruptive they often lead to depression, anxiety, and withdrawal from social situations.

Breakthrough Research: Your brain naturally heightens your senses during time periods of high arousal. Our research revealed the neural circuitry underlying arousal-linked improvement of sensory processing (Nature Neuro, 2019). We then optimized a noninvasive method of activating this circuitry to enhance perceptual acuity (J Neural Engr, 2020).

Our Product: A noninvasive, external neural interface that heightens users’ sensory acuity upon activation. The lightweight device can be comfortably worn during tasks which could be better performed with enhanced perception. The device sharpens senses by delivering a pattern of transcutaneous vagus nerve stimulation (tVNS) our team has shown induces neuromodulation which improves the brain’s ability to process sensory information. Our patent covers the novel use of VNS for sensory enhancement and required parameters.

Size of Potential Markets (Global):

1. Age-Related Sensory Loss (elderly/disabled assistive devices, \$35B by 2026; neuromodulation, \$9B by 2025), Neurodisorders (neurology devices, \$17B by 2026).
2. Augment healthy perception to improve performance and minimize human error. Military (human augmentation, \$207B by 2024; military wearables, \$6B by 2025), Sports and E-Sports (fitness wearables, \$15B by 2021), Workforce (nootropics, \$5B by 2025).

[Data from MarketsandMarkets, Wintergreen Research, Grand View Research, and Allied Market Research]

Current Standard: Stimulants heighten senses ~30 minutes after ingestion but cause insomnia, anxiety, cardiac damage and are addictive. Various nootropics come with unverified claims they improve brain function but are largely ineffective and often unsafe.

Our Competitive Advantages: A novel, bioelectronic method of instantly improving perception that is noninvasive, safe, and nonaddictive. Sharper Sense’s founding team are experts on the underlying mechanism of action, which provides full strength of effect seconds after activation that remains steady and constant until deactivation.

Competition: Sharper Sense expects to be the first neuromodulation device for enhancement of perceptual acuity. Existing VNS devices do not deliver stimulation patterns that will improve sensory processing (e.g. ElectroCore, LivaNova, tVNS Technology). However, we anticipate future competition from these VNS companies as well as other companies in the field of neuromodulation (e.g. Medtronic, NeuroSigma, NeuroMetrix).

Financial Projections (Unaudited):

Initial Target Market: The 64M elderly with age-related sensory loss in the United States
Price Per Unit: \$490

	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>	<u>2029</u>
Percent of Market Captured:	0.06%	0.2%	0.7%	1.5%	3.3%
Revenue:	\$26M	\$106M	\$241M	\$503M	\$1.59B
Gross Profit:	\$16M	\$66M	\$153M	\$328M	\$1.07B
Gross Margin:	60%	62%	63%	65%	68%