



## **FOR IMMEDIATE RELEASE**

**Contact:** Kendra Klemme  
PR Manager  
952.947.4583 / kendra\_klemme@starkey.com

### **Starkey Hearing Research Center Publishes in Collaboration with the University of California at Berkeley**

---

#### ***Research Looks at Listening Effort and the Effects of Background Noise and Noise Reduction***

**MINNEAPOLIS, Oct. 23, 2009** – The Starkey Hearing Research Center, a division of Starkey Laboratories, Inc., in collaboration with the University of California at Berkeley, is proud to announce the publication of a seminal research paper on the impact of hearing aid technology on listening effort. “Objective measures of listening effort: Effects of background noise and noise reduction” was published this week in the *Journal of Speech, Language, and Hearing Research*. The collaborating team included: Anastasios Sarampalis, Ph.D., and Professor Ervin Hafter, Ph.D., from the Department of Psychology, University of California at Berkeley; and Sridhar Kalluri, Ph.D., and Brent Edwards, Ph.D., from the Starkey Hearing Research Center.

“We are very proud of the results of our collaboration with the University of California at Berkeley,” said Brent Edwards. “Hearing loss impacts not just communication but cognitive function as well, and this research suggests that hearing aid technology can both improve speech understanding and reduce the cognitive effort necessary to understand speech in noisy situations. We hope this study moves future hearing aid research toward measuring outcomes beyond audibility to look at cognitive benefits as well.”

Hearing impaired people understand speech in quiet almost as well as people with normal hearing, but in background noise, hearing impaired people have a hard time understanding speech – even with the help of hearing aids. In addition, people with hearing loss are typically more mentally fatigued than people with normal hearing after listening to speech in noisy situations, suggesting that hearing loss results in greater cognitive effort to understand the speech in noise. This research looked at the effect of noise reduction and directional microphones on speech understanding and listening effort.

**-more-**

The study tested the following hypothesis: the positive effects of noise reduction and directional microphones could be to help reduce the cognitive effort used to receive and understand speech, making additional cognitive resources available for other tasks. People with normal hearing participated in two dual-task experiments – one reporting sentences or words in noise at various signal-to-noise ratios (SNR), and the other either holding words in short-term memory or responding in a complex visual reaction-time task.

## **Results**

SNR improvements provided by hearing aid directional microphones resulted in better performance in speech understanding and in the secondary task, indicating that the SNR improvements reduce listening effort. Noise reduction had no positive effect on speech recognition and understanding, but it led to better performance on the memory and visual secondary tasks at low SNRs. The conclusion that can be drawn is that noise reduction and directional microphones reduced listening effort and freed up cognitive resources for other tasks.

Professor Hafter says that, “While no one has found compelling evidence that noise reduction (NR) in a hearing aid improves speech reception, the results here clearly show an effect on performance in a second task. Costs in performance like this when the perceiver must share attention between channels has long been discussed in terms of attentional effort, a phrase that describes use of a limited cognitive resource. From that perspective, NR, by reducing the effort needed to do the auditory task in high noise, allowed its application to the visual. This strongly suggests that dual-task methodology be applied in testing the efficacy of any algorithm designed for hearing and, perhaps, other devices used in auditory communication. From this perspective, these data seem to fit with the growing concern that the danger of cell-phone usage goes far beyond the business of mechanically operating the phone and focuses on the attentional overload associated with holding an intense, informational conversation.”

## **About Starkey®**

Starkey Laboratories, Inc. is a privately held, global hearing technology company headquartered in Eden Prairie, Minn. The company is recognized for its innovative design, development and distribution of comprehensive digital hearing systems. Founded in 1967, Starkey employs over 3,500 people, operates 22 facilities and conducts business in over 100 markets worldwide. For more information, visit [starkeypro.com](http://starkeypro.com). For more information about the Starkey Hearing Research Center, visit [starkeyresearch.com](http://starkeyresearch.com).

**About University of California at Berkeley**

The University of California was chartered in 1868, and what would become its flagship campus was soon established at Berkeley, a city across the bay from San Francisco. Today, UC Berkeley is considered the world's premier public university and a wellspring of innovation, claiming 21 Nobel Laureates, eight of whom are current faculty members. The campus is home to more than 130 academic departments and more than 80 interdisciplinary research units.

**###**