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Measuring Fatigue Through the Voice: Speech 'Flattens' After 24 Hours Awake

*What can scientists learn from watching a group of people sitting around, chatting, playing movies, reading, and happily making new friends? Quite a lot, says University of Melbourne, Australia acoustician Adam Vogel, who carefully observed this sort of group in a fatigue management study he and his colleagues describe this month in *The Journal of the Acoustical Society of America*.*

Their report shows the effects of sustained wakefulness on speech and describes a novel method to acoustically analyze the effects of fatigue on the central nervous system as revealed through speech.

The findings are significant to workers, employers, public safety officials, and military leaders who are concerned with managing fatigue over long shifts, notes Vogel.

"There is increasing interest in the development of objective non-invasive systems that can be used to assist the identification and management of fatigue in both health and workplace settings," he says.

Measuring fatigue by analyzing a person's speech and quantifying any changes from their normal, rested speech may enable doctors to make objective decisions about a person's ability to function in a work environment. It may also be a useful tool for monitoring fatigue in clinical trials where alertness is a key measured outcome.

The Australian study involved 18 young adults, who provided speech samples (sustained vowels, reading counting and reading tasks) every two hours. Vogel and his colleagues looked at components of speech such as length of pauses and total time to complete a spoken task. Their results showed that as fatigue progresses, speech slows and variations in pitch increase and tone diminishes. Their conclusion is that we have less control over the muscles that produce speech as we become more and more tired. "Although remaining awake for 24 hours is physically and mentally exhausting, it's actually a great way to make new friends," notes Vogel. "Most of them just entertained themselves between testing by watching movies, reading or talking amongst themselves."

Adam P. Vogel, Janet Fletcher, and Paul Maruff. Acoustic analysis of the effects of sustained wakefulness on speech. *The Journal of the Acoustical Society of America*.