

Extended high-frequencies and working memory provide diagnostic clues to speech-in-noise problems in adults with normal hearing

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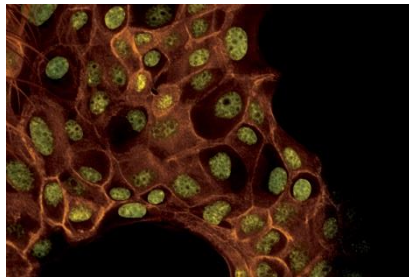
^aThe HEARing Cooperative Research Centre,

^bThe National Acoustic Laboratories and

^cMacquarie University

Audiology Australia National Conference 20-23 May 2018 Sydney

creating sound value™



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Hearing advice: I might listen, if you say something interesting

Trouble keeping up with conversation may say more about those around you than your need for a hearing aid.

STEPHEN PERKINS 12:00AM April 9, 2018

PRESENTING PROBLEM

- Needs REPEATS
- Difficulty FOLLOWING CONVERSATION
- Can't hear in NOISY PLACES
- LOUDNESS SENSITIVITY

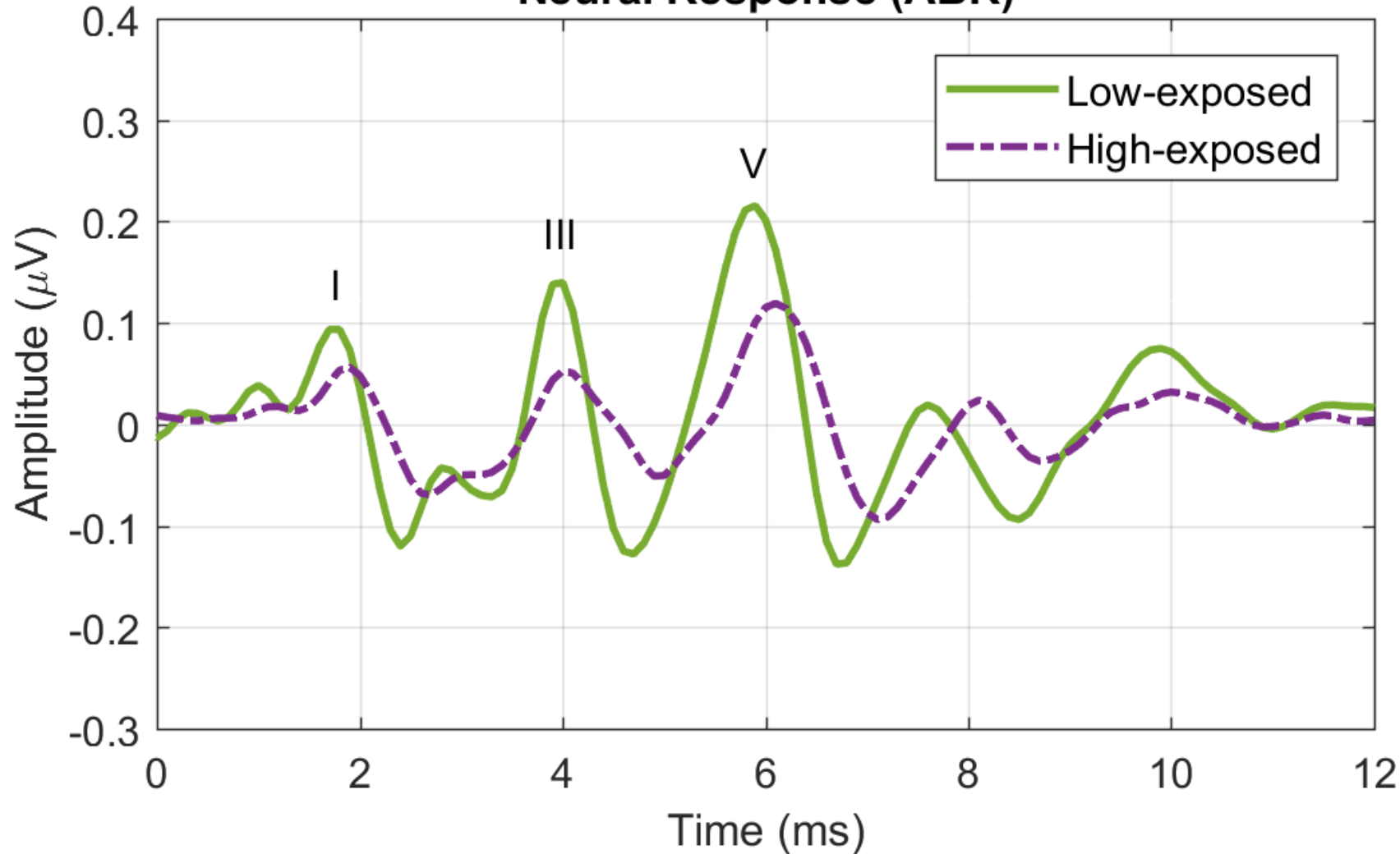
AUDIOLOGIST ADVICE

- ✓ Hearing PERFECT for age group
- ✓ ABSOLUTELY NOTHING WRONG
- ✓ Disinterested in subject matter so not paying attention!



I kept jacking up the volume control on my television alarmingly, over-shooting 50 on the volume control. Was my TV outdated, or was it my ears?

Neural Response (ABR)



Participants with higher lifetime noise exposure have degraded neural response to sound

Slide courtesy of Dr Joaquin Valderrama

- Which factors predict the ability to understand speech in noise?
- Can we develop a model for predicting which normal hearing adults will experience difficulty understanding speech in noise?
- Is the model accurate?



Composite speech-in-noise score (CSS)



MACQUARIE University

NAL
National Acoustic Laboratories

THE HEARING CRC

SELF REPORT PLUS TWO SPEECH-IN-NOISE MEASURES

1. You are talking with one other person and there is a TV on in the same room. Without turning the TV down, can you follow what the person you're talking to says?

Comparing your ability now with your ability before getting your hearing aids

Much worse Unchanged Much better

Net applicable

2. You are listening to someone talking to you, while at the same time trying to follow the news on TV. Can you follow what both people are saying?

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Net applicable

3. You are in conversation with one person in a room where there are many other people talking. Can you follow what the person you are talking to is saying?

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Net applicable

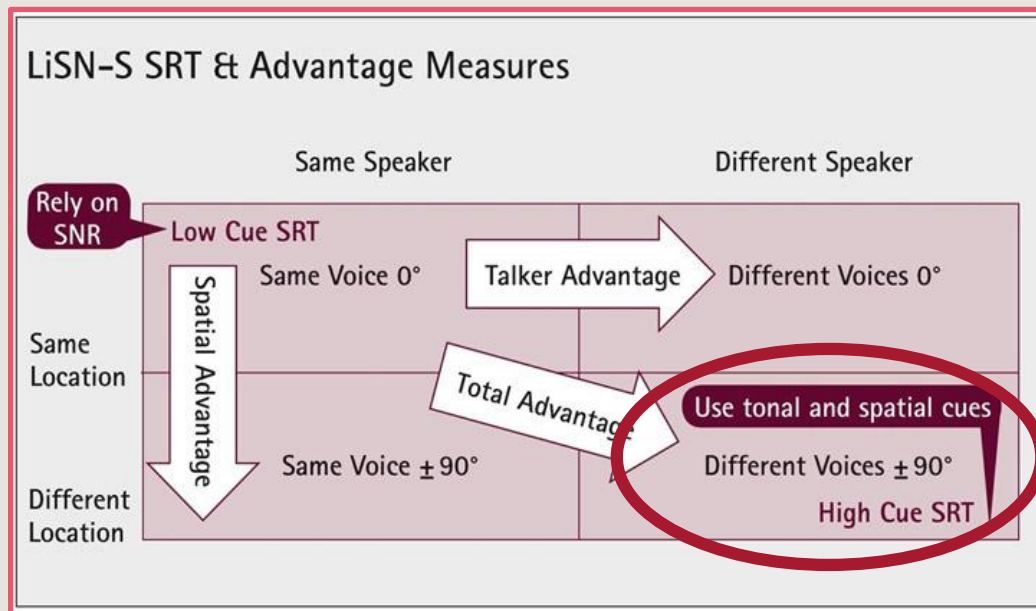
4. You are in a group of about five people in a busy restaurant. You can see everyone else in the group. Can you follow the conversation?

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Much worse Unchanged Much better

Net applicable

SSQ12 speech items

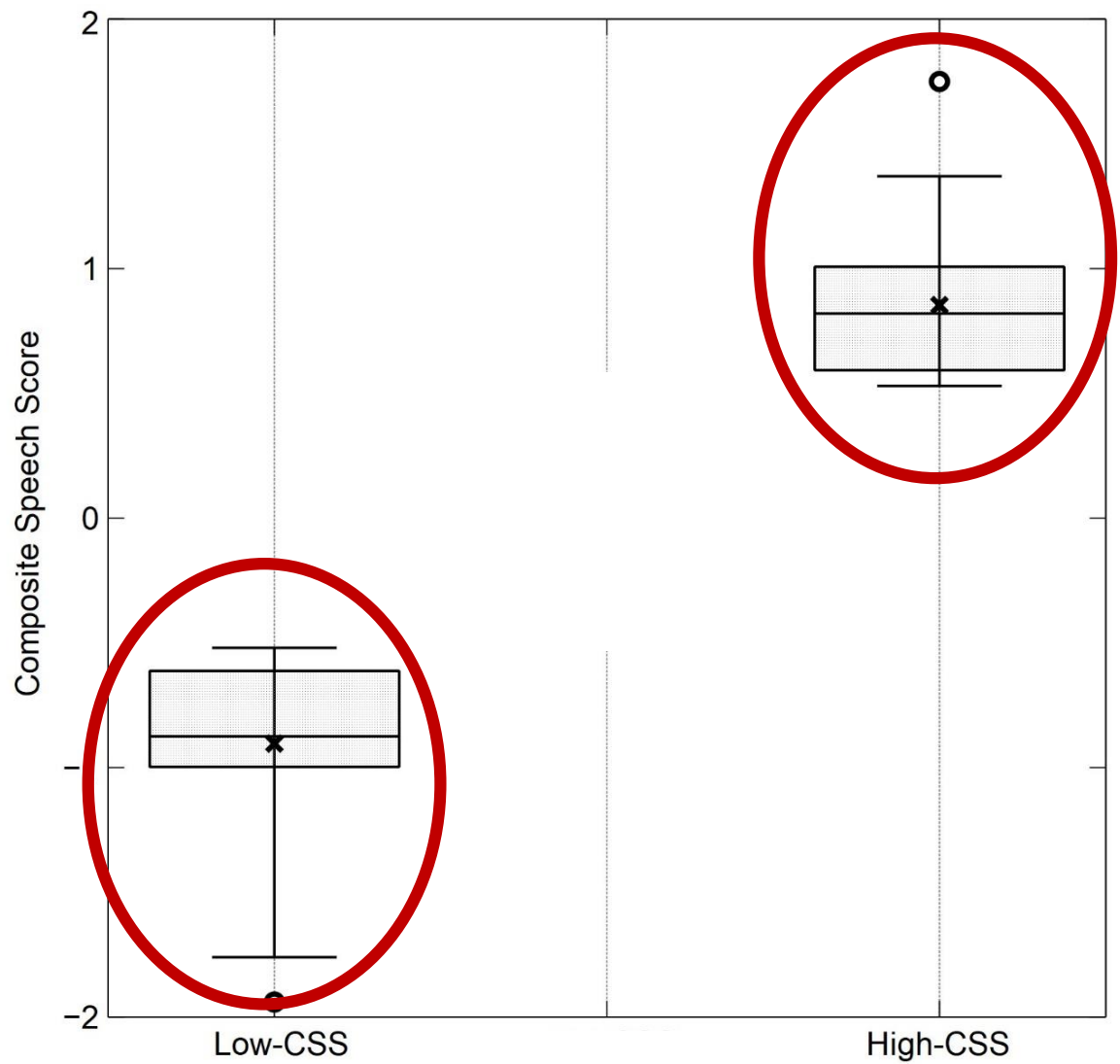


LiSN-S

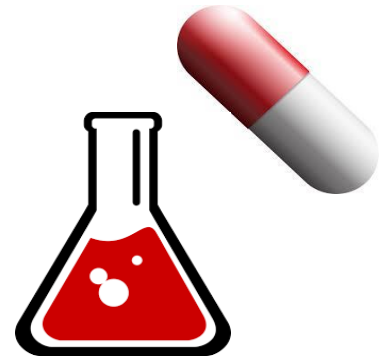


NAL-DCT

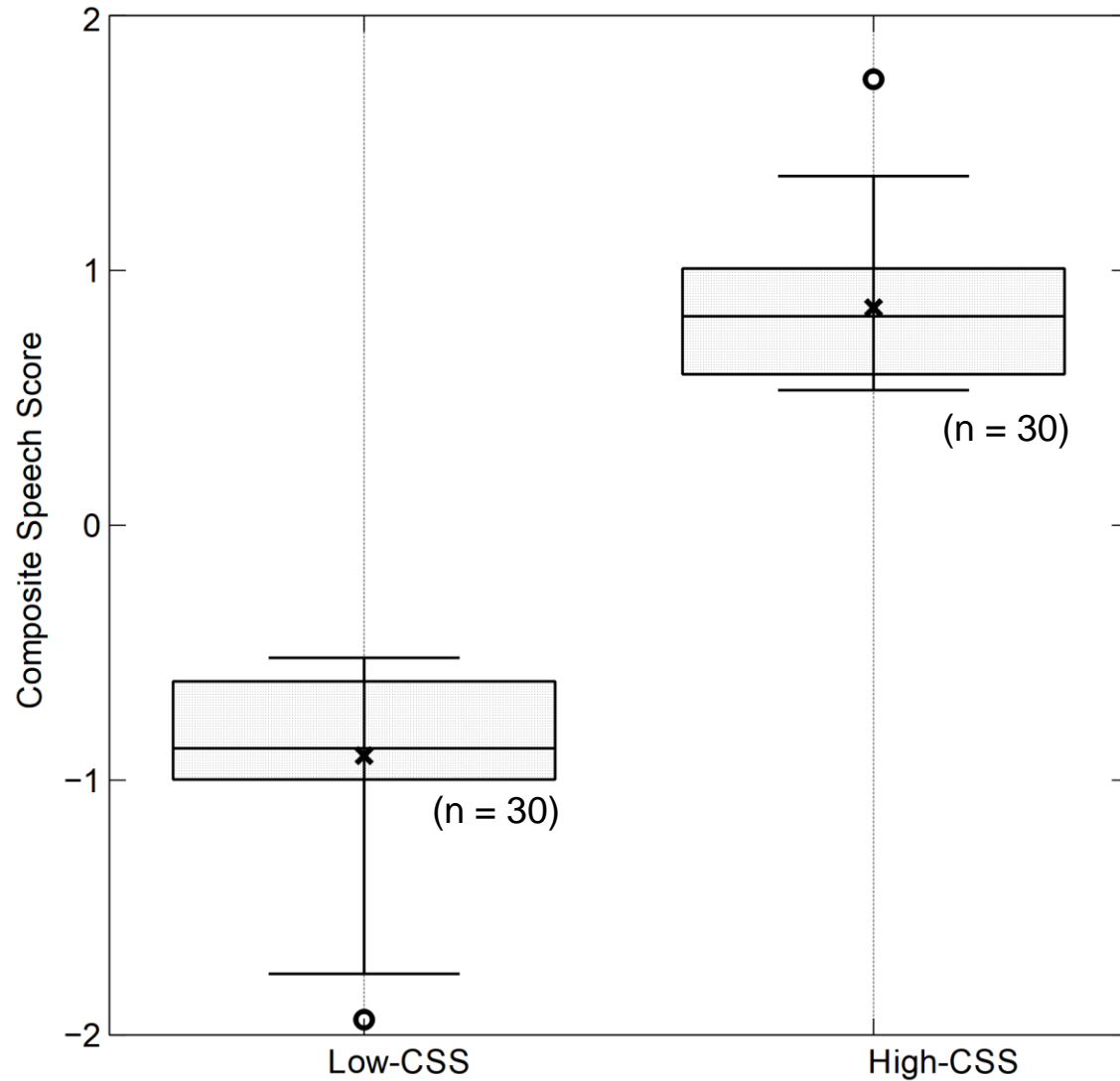
No differences between groups



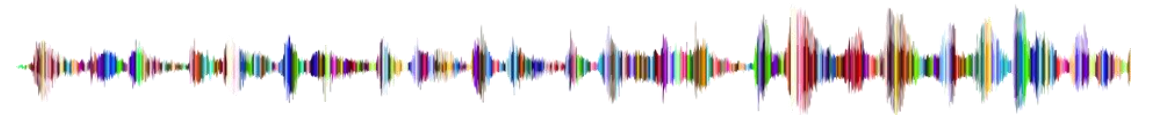
Low-CSS = High-CSS



Group Differences

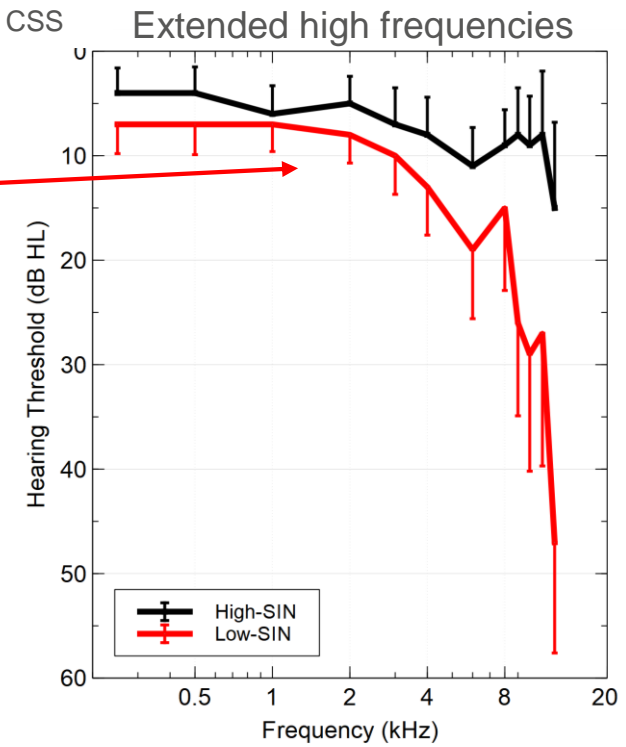
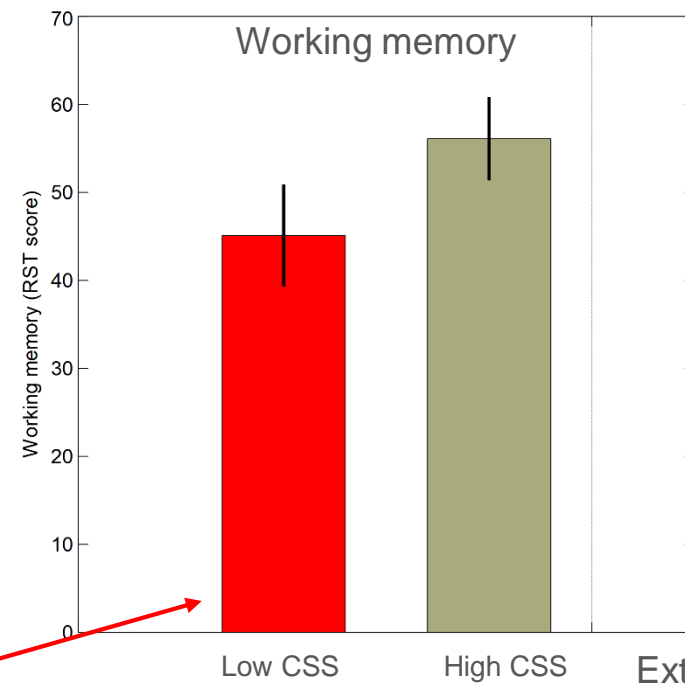
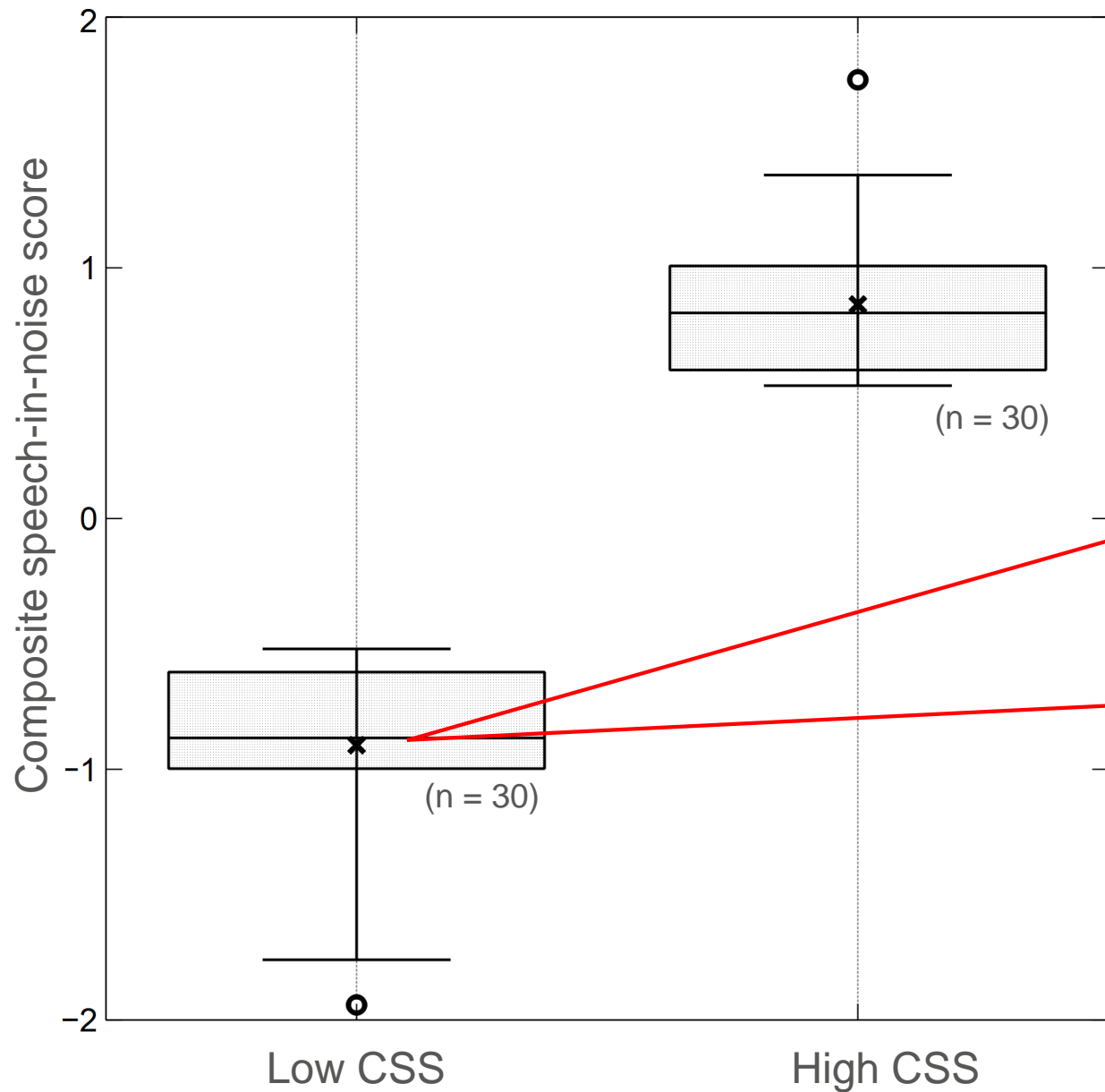


Low-CSS < High-CSS



Attention

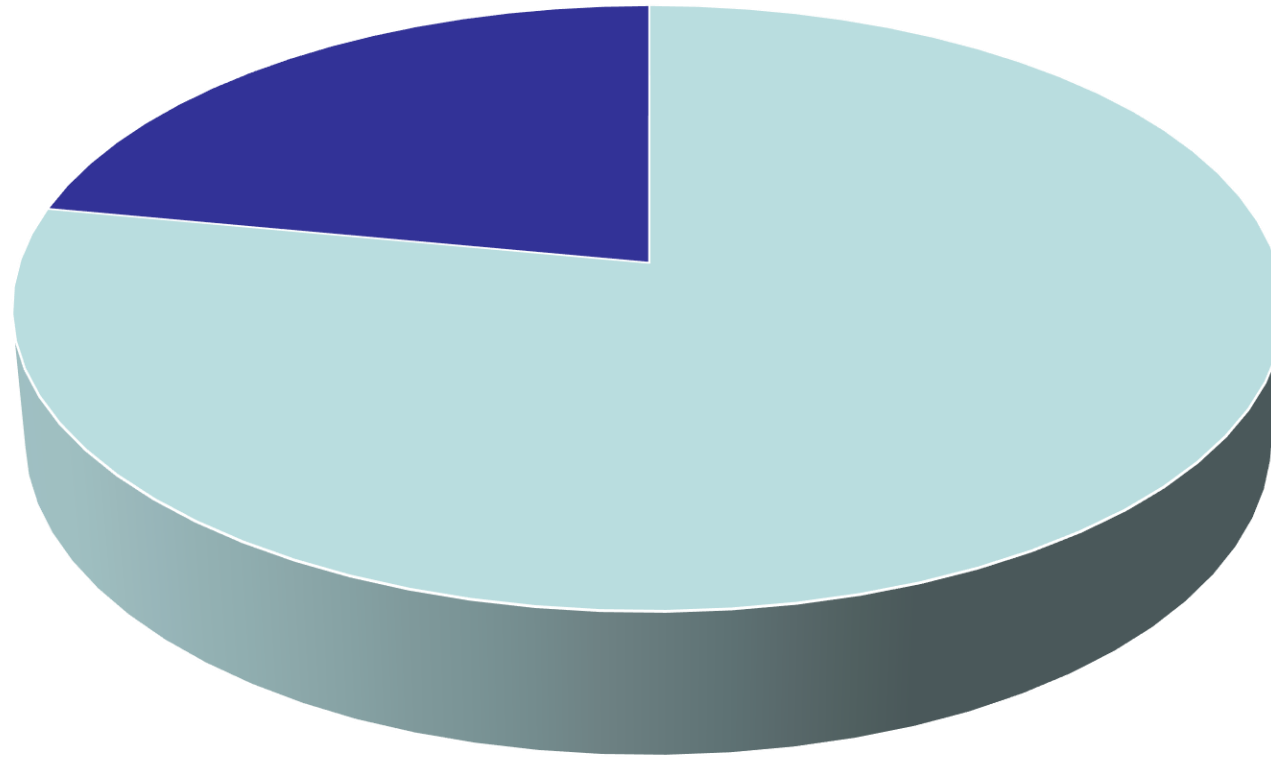
Low-CSS: poorer attentional skills



What does it all mean?

ACCURACY OF MODEL

76/100



CLINICAL IMPLICATIONS

➤ Extended high frequencies:

- ❖ early indicator of subclinical damage
- ❖ baseline monitoring hearing levels
- ❖ counselling re: noise exposure / hearing protection
- ❖ extended bandwidth devices

➤ Working memory

- ❖ clinically viable tests
- ❖ training packages

Yeend, I., Beach, E.F., and Sharma, M. (under review) Working memory and extended high-frequency hearing in adults: diagnostic predictors of speech-in-noise perception.

EHF AUDIOMETRY

Benefits of Extended High-Frequency Audiometry for Everyone

By David Moore, PhD; Lisa Hunter, PhD; & Kevin Munro, PhD

One of the pillars of audiology is the notion of "normal hearing" as shown by pure tone audiometry. Yet, hearing health care professionals know that audiograms are not the best predictors of some aspects of hearing, especially the common task of listening to speech in a challenging environment (*Hearing Journal*, 2000;53[3]:46). It seems likely that simple pure tone detection is unable to predict the complexity of supra-threshold speech perception. But there is another possibility. In this article, we ask: Why do we test hearing using pure tones only up to 4 or 8 kHz when we know very well that healthy young people can hear



“Get testing! What are you waiting for?”

Moore et al (2017) Benefits of Extended High-Frequency Audiometry for Everyone. *The Hearing Journal* 70, 50-55.

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VALIDATE CLIENT CONCERNS

- ✓ Test EXTENDED HIGH FREQUENCIES
- ✓ Test WORKING MEMORY
- ✓ Counsel re: NOISE EXPOSURE HEARING PROTECTION REHABILITATION options



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Thank you for listening

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- The substantial contribution in time and effort of participants involved in our study



Australian Government
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Innovation and Science

Business
Cooperative Research
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