



Connecting with NAL


SOUNDBITES WEBINAR SERIES

TOWARDS THE MEASUREMENT OF LISTENING EFFORT IN A CLINIC ENVIRONMENT


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How is listening effort perceived?


37% of the Australian population has speech-in-noise difficulties



I have to try harder to hear. I can't always hear what they're speaking to me about. It takes a lot of concentration.



Other people must be able to filter that background noise and put it down to a lower level so that they can focus on conversation, so I must have a problem because I can't do that. **It does take some of the pleasure of being around people.**

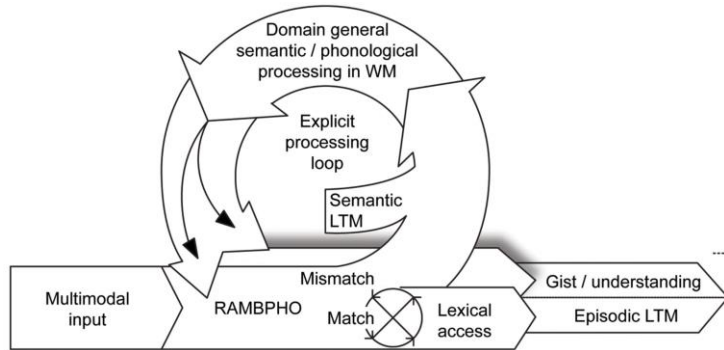


There isn't really a test that we have available to show whether someone has an abnormally high difficulty with noise compared to other people.

Gilliver et al. 2013, 2015

How to measure listening effort

ELU



Rönnberg et al. 2013

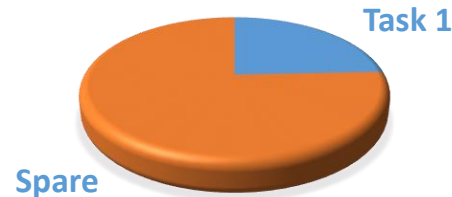
Dual-task

- Task 1. Speech-in-noise task
- Task 2. Behavioural task



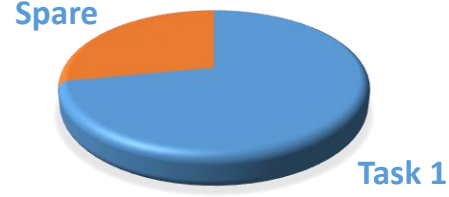
Reaction time

Speech in low noise



Large amount of spare cognitive resources (short reaction time)

Speech in high noise

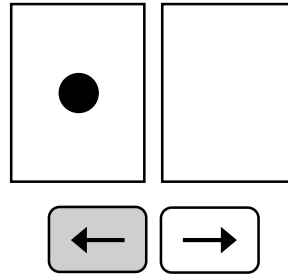


Small amount of spare cognitive resources (long reaction time)

Self-reported effort

NAL strategy to measure listening effort

- Task 1: Repeat a sentence in noise
- Task 2: Auditory-visual task
 - Male name – pointing towards
 - Female name – pointing away



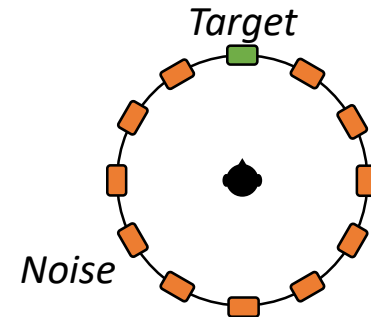
Mark buys three nice flowers

Intelligibility

Repeat

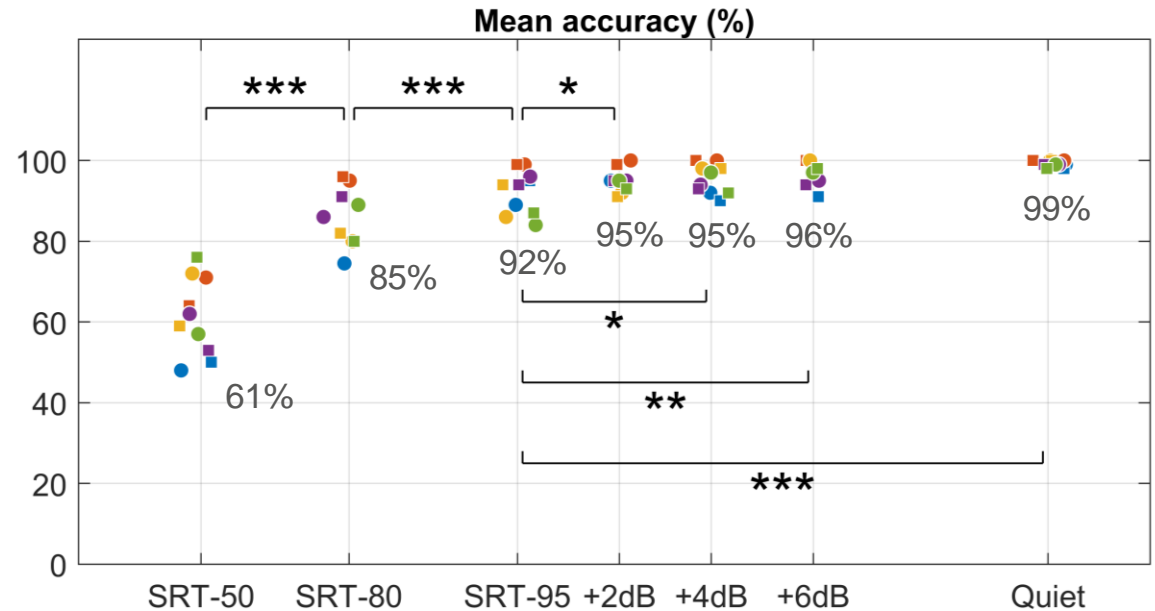


- Realistic cafeteria noise
- Test at different SNRs
 - 50%, 80%, and 95% intelligibility
[SRT-50, SRT-80, SRT-95]
 - Noise is fixed – stimulus level varies



Results – Intelligibility

ID	Gender	Age
P01	Male	46
P02	Male	36
P03	Male	43
P04	Male	35
P05	Male	38



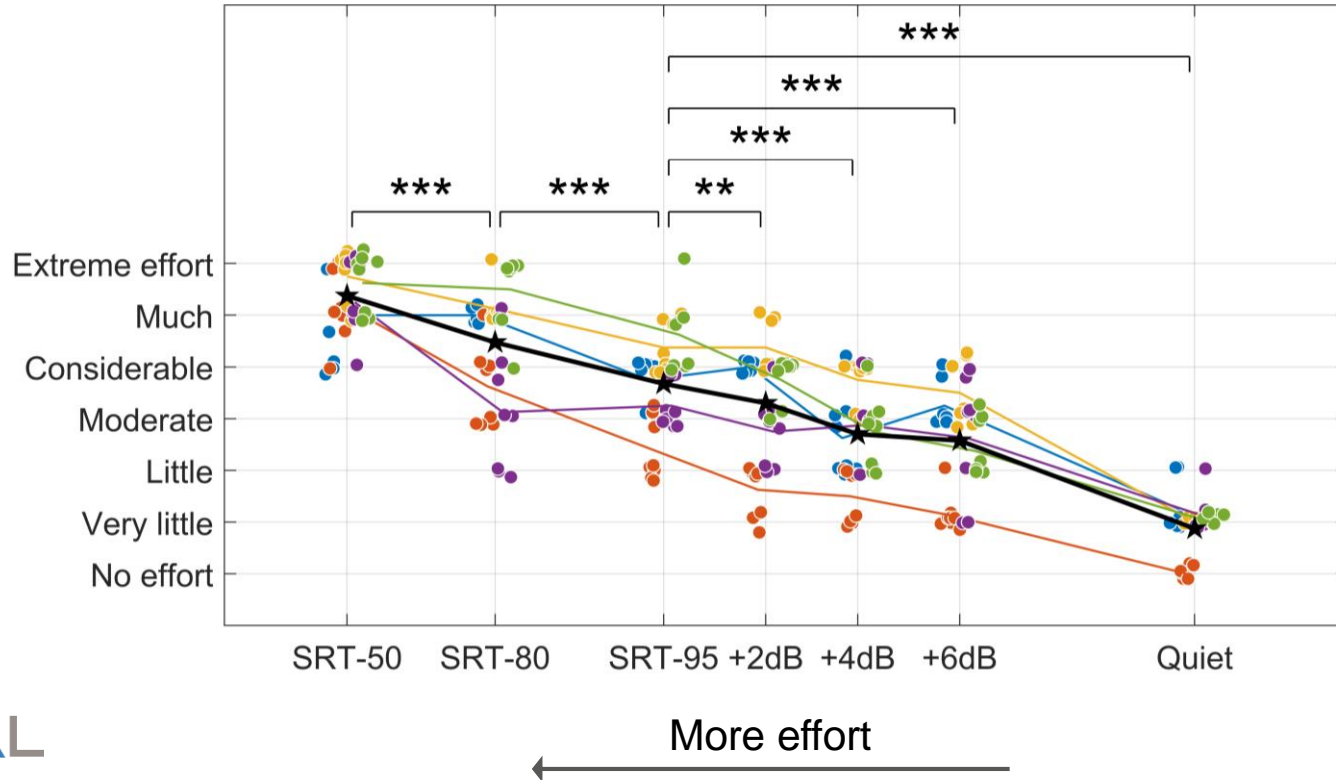
More effort ←

* p -value < 0.05

** p -value < 0.01

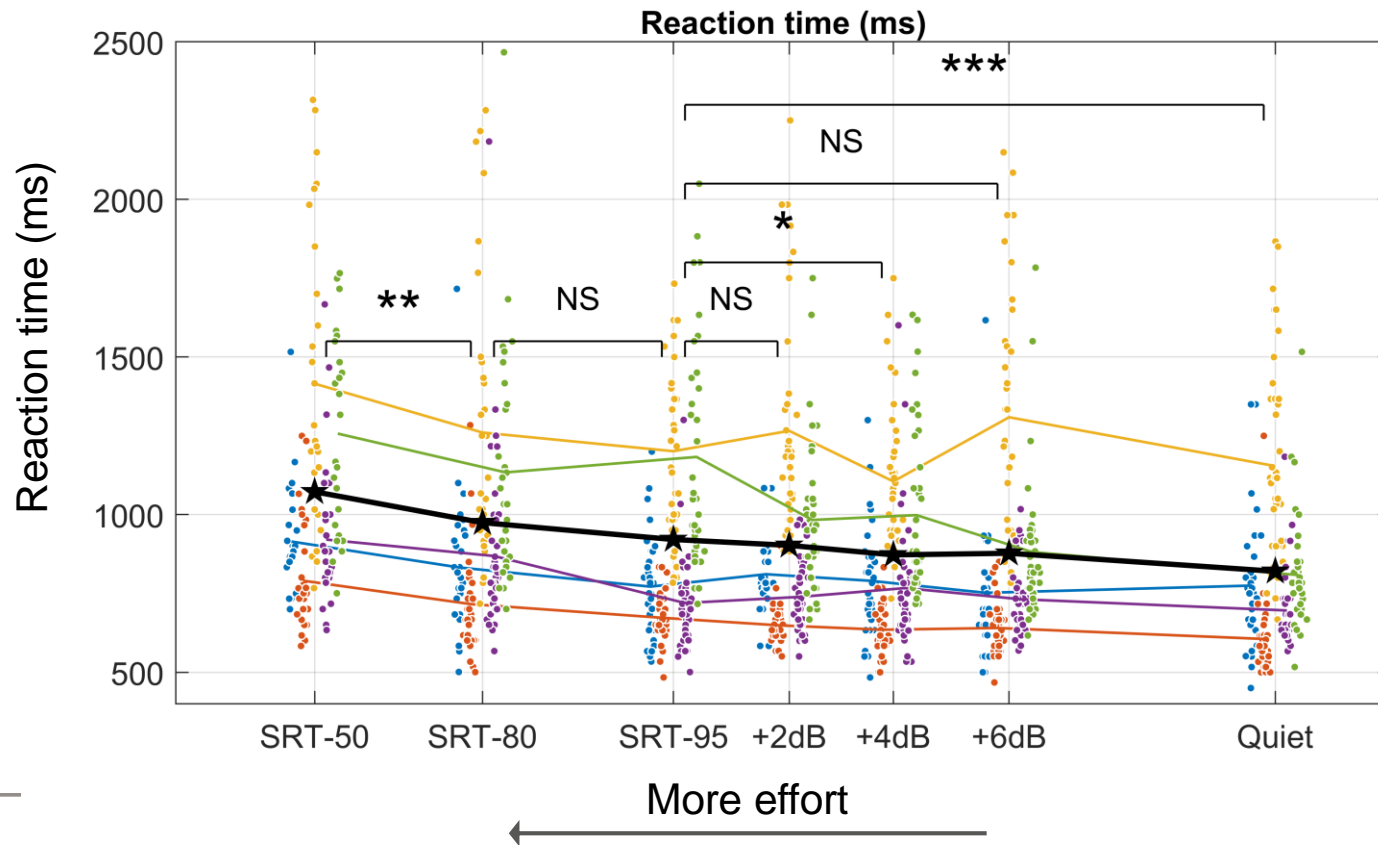
*** p -value < 0.001

Results – Self-reported effort



* *p*-value < 0.05
** *p*-value < 0.01
*** *p*-value < 0.001

Results – Reaction time



* p -value < 0.05

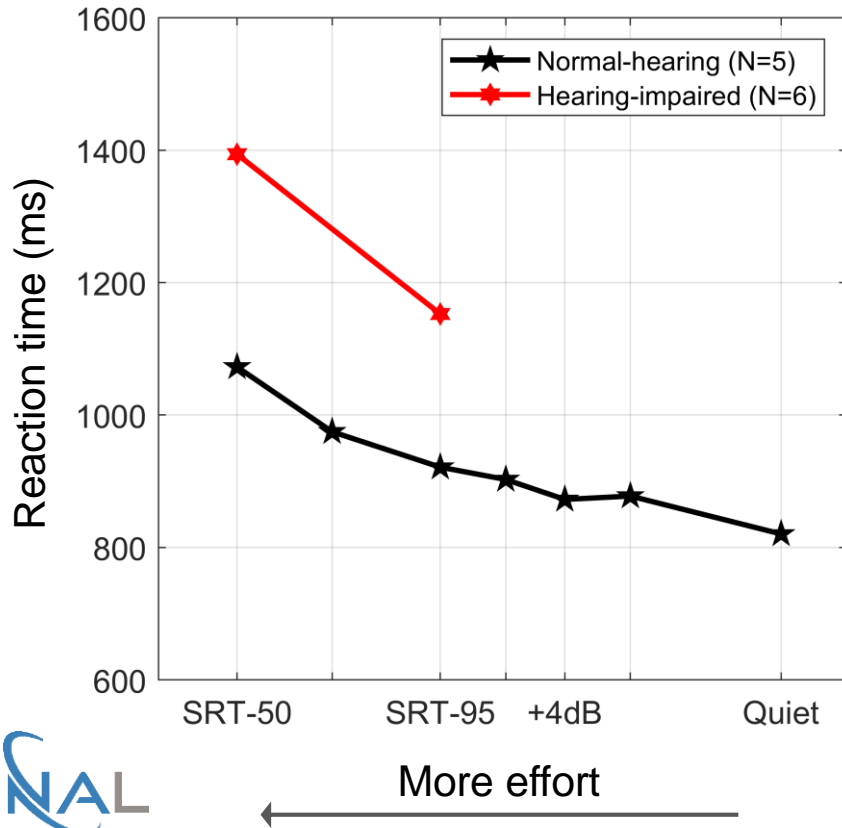
** p -value < 0.01

*** p -value < 0.001

NS - not significant



Results – Reaction time

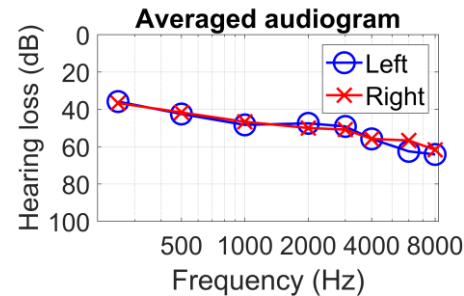


Normal hearing

ID	Gender	Age
P01	Male	46
P02	Male	36
P03	Male	43
P04	Male	35
P05	Male	38

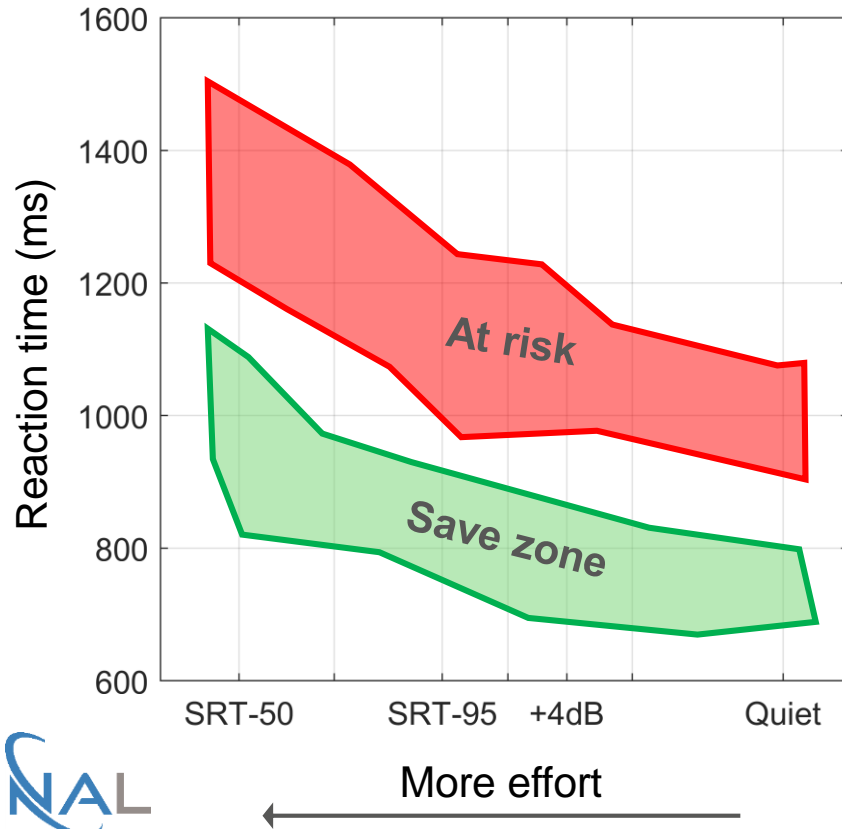
Hearing impaired

ID	Gender	Age
P01	Female	22
P02	Male	73
P03	Male	74
P04	Female	78
P05	Male	74
P06	Male	80



- Bilateral downward-sloping hearing loss
- Experienced HA users

Next steps



- ✓ Normal-hearing individuals with and without speech-in-noise difficulties
- ✓ Characterise their performance
 - Age
 - Hearing difficulty
 - English proficiency
 - Cognitive capacity
- ✓ Categorise individuals

Take-home message

- ✓ NAL approach based on dual-task and self-reported effort is sensitive to listening effort.
- ✓ The longer reaction time observed in the older and hearing-impaired group is consistent with the extra effort that they require to communicate in challenging scenarios.
- ✓ We are currently investigating the clinical value of the proposed methodology in order improve the diagnosis of the hearing difficulties of this population.

Thanks



Paul Jevelle
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Research Engineer



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Head of Engineering



Elizabeth Beach
Head of Prevention



Australian Government
Department of Health





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Q&A

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