

# Pitch, rhythm, and working memory contribute to speech-in-noise perception in older adults with hearing aids

Lo, C. Y.<sup>1</sup>, Dubinsky, E.<sup>1</sup>, Wright-Whyte, K.<sup>1</sup>, Zara, M.<sup>1</sup>, Singh, G.<sup>1,2,3</sup>, Russo, F. A.<sup>1</sup>

<sup>1</sup>Toronto Metropolitan University, Toronto, ON, Canada

<sup>2</sup>Phonak Canada, Mississauga, ON, Canada

<sup>3</sup>University of Toronto, Toronto, ON, Canada

[chi.lo@torontomu.ca](mailto:chi.lo@torontomu.ca)

## INTRODUCTION

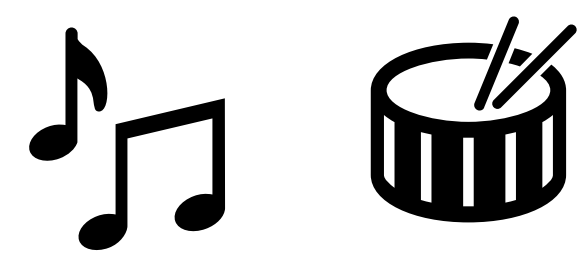
Deafness and hearing loss affects more than 1.5 billion people globally, and ~1 million Canadians. Hearing aids (HAs) are the primary solution for mild to moderate sensorineural hearing loss and effectively improve listening and quality of life. However, HAs are of limited use in complex acoustic environments such as in the presence of noise. Better speech-in-noise (SIN) perception is positively associated with HA satisfaction<sup>1</sup>.

## OBJECTIVE

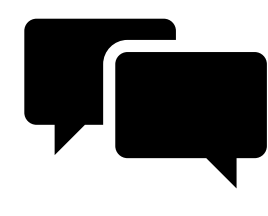
Examine how music factors (such as pitch, rhythm, and timbre) and cognitive factors (such as working memory, WM) are associated with better SIN outcomes in older adults with HAs.



Cognition



Music



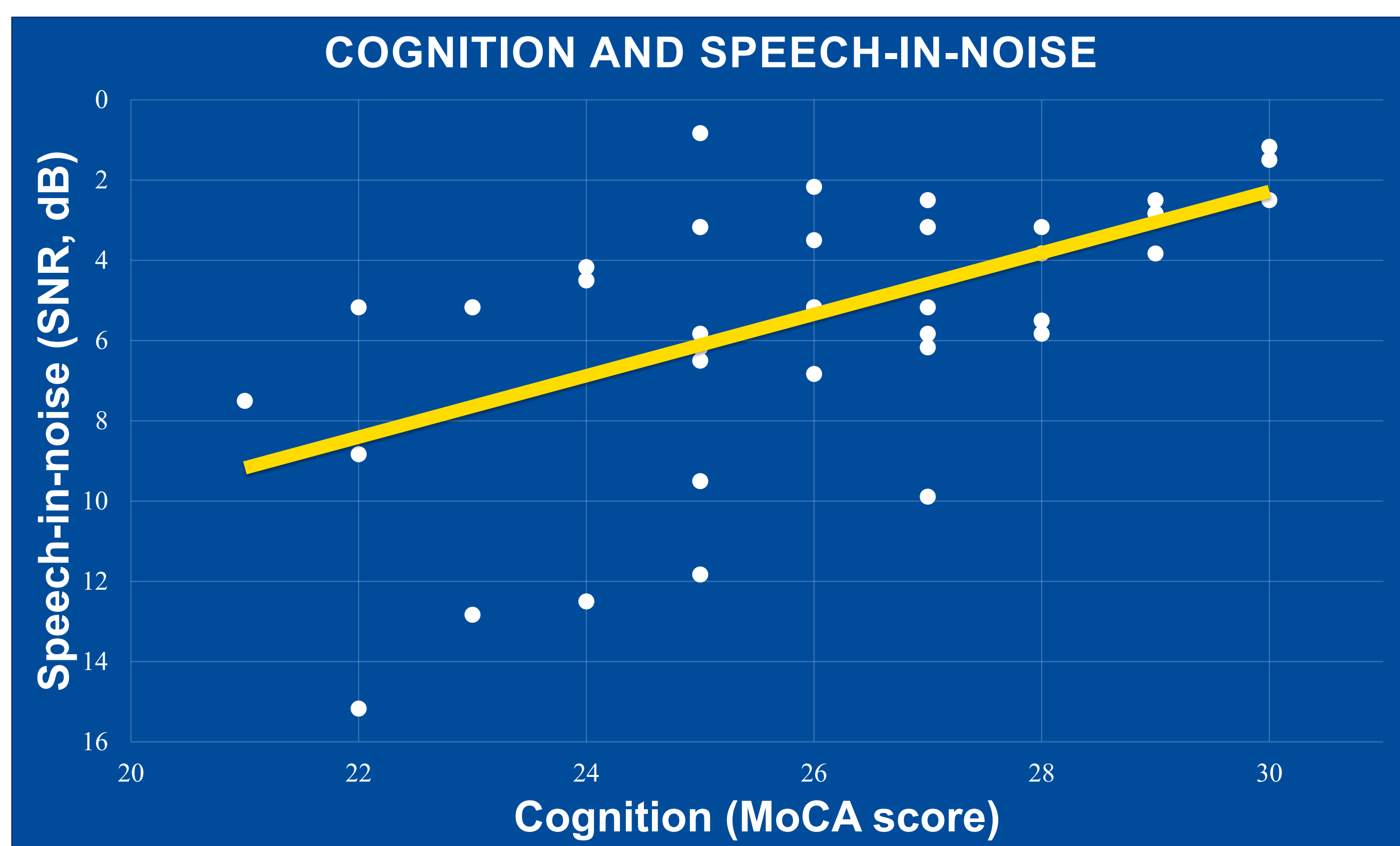
Speech-in-Noise

## METHODS

**Participants:** Forty-two adults aged between 57 and 90 years ( $M = 73.5$  years, 28 female and 14 male) with a moderate/moderately-severe bilateral hearing loss ( $M = 46.9$  dB HL<sub>4fPTA</sub>).

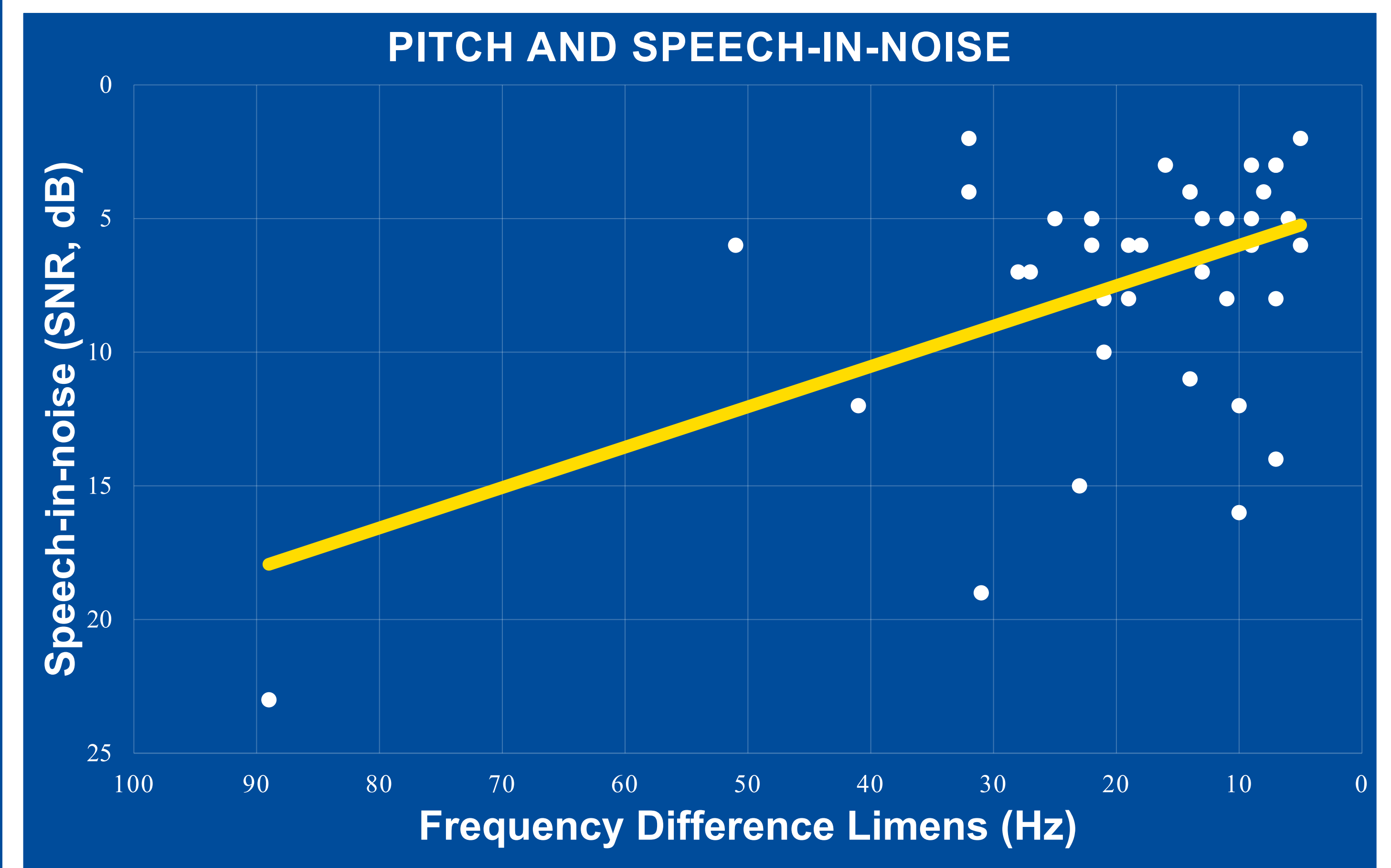
**Materials:** Montreal Cognitive Assessment (MoCA), Frequency Difference Limens (FDL), Beat Alignment Test (BAT), and QuickSIN.

## FINDINGS

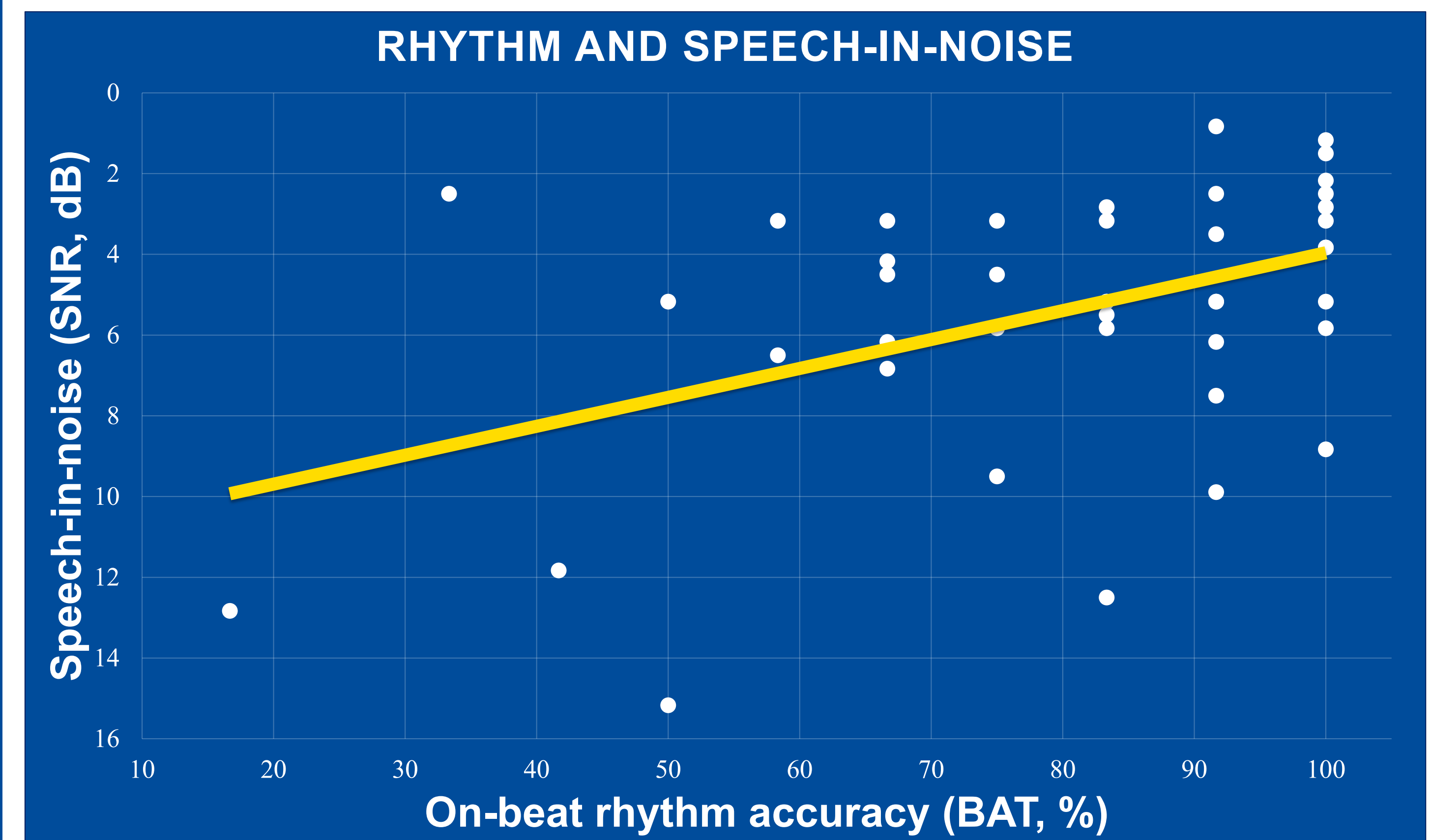


As expected<sup>2</sup>, there was a statistically significant correlation between WM and SIN perception,  $r(40) = -.651, p < .001$ .

## FINDINGS



There was a statistically significant correlation between pitch and SIN perception, Kendall  $\tau_b = .187, p = .048$



There was a statistically significant correlation between on-beat rhythm and SIN, Kendall  $\tau_b = -.263, p = .046$

## CONCLUSION

These findings suggest pitch, on-beat rhythm, and WM support SIN perception for older adult HA users. Although the association between rhythm and SIN has been found in young adults with normal hearing<sup>3</sup>; to the best of our knowledge, this has not been reported for older adults with HAs.

## REFERENCES

- Davidson, A., Marrone, N., Wong, B., & Musiek, F. (2021). Predicting Hearing Aid Satisfaction in Adults: A Systematic Review of Speech-in-noise Tests and Other Behavioral Measures. *Ear and Hearing* 42(6), 1485–1498.
- Rönnerberg, J. (2003). Cognition in the hearing impaired and deaf as a bridge between signal and dialogue: A framework and a model. *International Journal of Audiology* 42(1).
- Slater, J., & Kraus, N. (2016). The role of rhythm in perceiving speech in noise: A comparison of percussionists, vocalists and non-musicians. *Cognitive processing*, 17(1), 79–87.