



# ACCURATE ESTIMATION OF ABILITIES TO UNDERSTAND SPEECH IN NOISE: EFFECTS OF PERSONALITY

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## INTRODUCTION

- Previous research have demonstrated a relationship between personality and self-reported, hearing-related questionnaires.<sup>1, 2, 4, 5, 6, 7</sup>
- The perception of increased hearing aid (HA) benefit has been associated with personality types such as "Agreeableness"<sup>5</sup> [NEO Five-Factor Inventory (NEO-FFI)]; "Extraversion"<sup>4</sup>, "Perceiving"<sup>7</sup> [Myers-Briggs Type Indicator (MBTI)]; "Artisan"<sup>2</sup> [Keirsey Temperament Sorter (KTS)]; and those with high "Locus of Control"<sup>4</sup> [Multidimensional Health Locus of Control Scale (MHLC)].
- Conversely, the perception of reduced HA benefit has been associated with personality types such as "Neuroticism"<sup>5</sup> (NEO-FFI); "Idealist"<sup>1, 2</sup> (KTS); "Guardian"<sup>1, 2</sup> (KTS); "Thinking"<sup>7</sup> (MBTI), "Judging"<sup>7</sup> (MBTI); and those with a more external "Locus of Control"<sup>4</sup> (MHLC).
- It is well known that individuals vary in the accuracy with which they estimate their hearing ability.<sup>8</sup>
- Pre-identification of those who are likely to receive reduced benefit from amplification influenced by personality could likely help with clinical decision making and counseling strategies.

## PURPOSE & HYPOTHESIS

**PURPOSE:** To evaluate the extent to which personality affects the discrepancy between individuals' perceived and actual performance on a measure of speech understanding in the presence of background noise.

**HYPOTHESIS:** Individuals who demonstrate greater degrees of "Extraversion", "Openness to Experience", and "Agreeableness" will tend to overestimate their speech understanding abilities, while those who demonstrate greater degrees of "Neuroticism" will tend to underestimate their abilities.

## PARTICIPANTS

- 125 English-speaking adult hearing aid users recruited from two sites: University of Washington and University of Iowa.
- Bilateral, symmetrical, mild to moderately-severe sensorineural hearing loss.

n = 125	Age (years)	PTA
Average	68	40
Max	79	70
Min	29	15
Range	50	55

- Montreal Cognitive Assessment (MoCA)<sup>10</sup> screening indicating adequate cognitive function for testing (> 21/30).
- Part of a larger study comparing speech understanding in background noise and hearing aid success.

**Table 1.** Mean age and bilateral hearing thresholds across subjects. PTA calculated using AC  $\theta$  at 500, 1000, and 2000 Hz, averaged between ears.

## METHODS

### PERSONALITY ASSESSMENT:

Participants each completed the **NEO Five-Factor Inventory - 3 (NEO-FFI-3)**<sup>3</sup> personality type sorter, a 60-item questionnaire in which each participant is given an individual score for five personality "domains" that are comprised of six "facets"<sup>Tab. 2</sup>, higher scores corresponding to greater association towards that particular domain, and vice versa.

### SPEECH RECOGNITION ESTIMATION ABILITY:

Participants also completed the **Performance-Perceptual Test (PPT)**<sup>8</sup>, which measures the mismatch between what the patient can hear (objective) and what they believe they can hear (subjective). The PPT consists of three components:

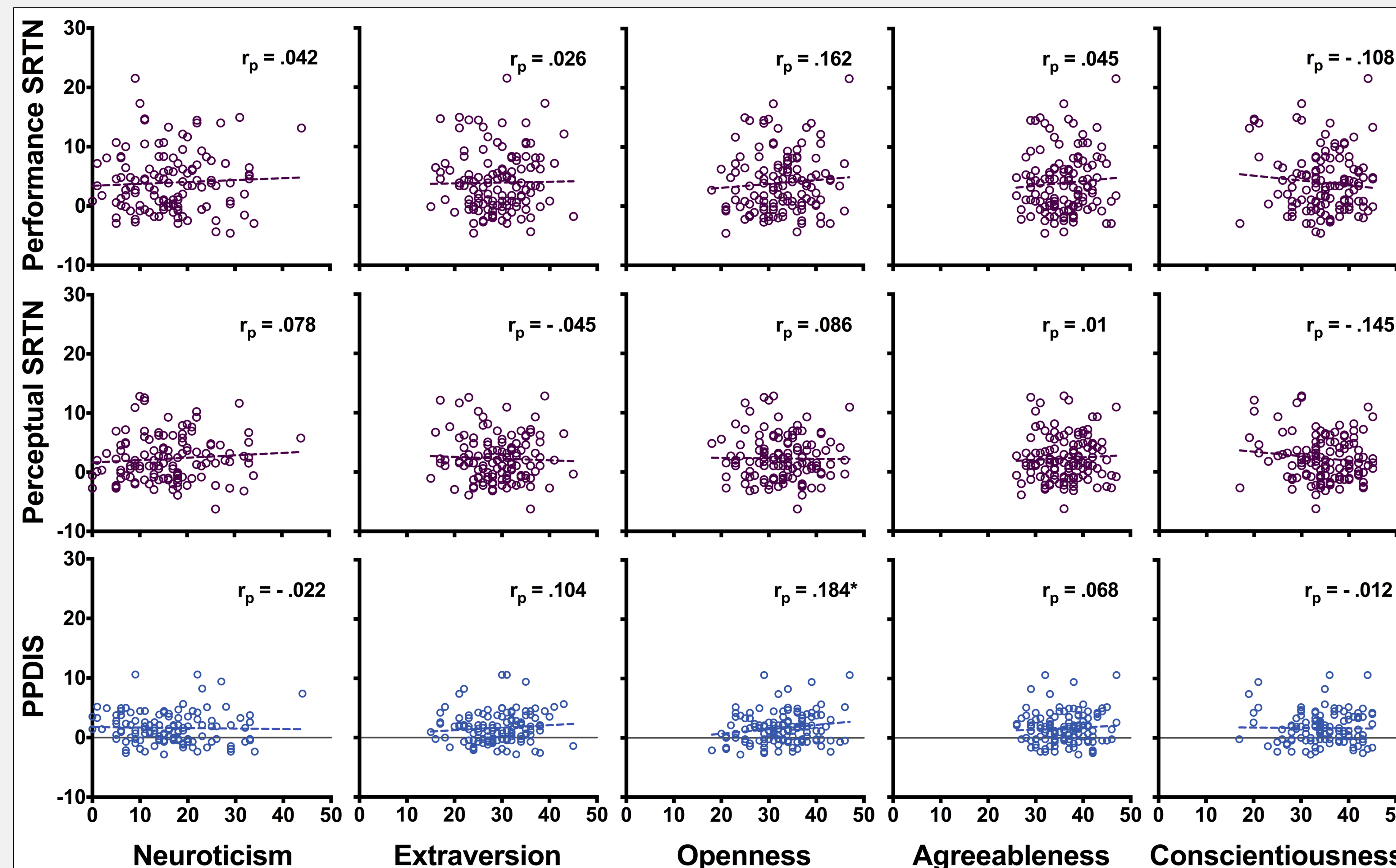
- **Performance Speech Reception Threshold in Noise (Performance SRTN):** unaided signal-to-noise ratio for understanding 50% correct (SNR-50) using Hearing in Noise Test (HINT) stimuli and adaptive tracking protocol.
- **Perceptual SRTN:** unaided SNR at which participant can "just understand everything" (yes/no response) using HINT stimuli and adaptive tracking protocol.
- **Performance Perceptual Discrepancy (PPDIS):** measure of accuracy to which individuals (mis)judge their own unaided hearing ability in noise. **Performance SRTN - Perceptual SRTN = PPDIS.** Overestimation is indicated by (+)PPDIS values. Underestimation is indicated by (-)PPDIS values.

The relationship between personality and the PPT was examined using correlational analysis<sup>Fig. 1</sup>.

DOMAINS	FACETS					
Neuroticism	Anxiety	Angry Hostility	Depression	Self-Consciousness	Impulsiveness	Vulnerability
Extraversion	Warmth	Gregariousness	Assertiveness	Activity	Excitement-Seeking	Positive Emotions
Openness to Experience	Fantasy	Aesthetics	Feelings	Actions	Ideas	Values
Agreeableness	Trust	Straight-forwardness	Altruism	Compliance	Modesty	Tender-Mindedness
Conscientiousness	Competence	Order	Dutifulness	Achievement Striving	Self-Discipline	Deliberation

**Table 2.** The NEO-FFI-3 Five-Factor Model: 5 personality domains with six facets grouped per domain.<sup>3</sup>

## CORRELATIONS



**Figure 1.** Scatterplots between NEO-FFI-3 personality domains (x-axes) and Performance SRTN, Perceptual SRTN, and PPDIS (y-axes) showing partial correlations controlling for age and better ear PTA. The personality trait, Openness to Experience, was a significant predictor for PPDIS, demonstrating a small positive correlation (\*p = 0.042). All other personality domains were insignificant for either Performance SRTN, Perceptual SRTN, or PPDIS.

## RESULTS

PERSONALITY DOMAIN	Study Mean	Study SD	Population Average <sup>a,b</sup>	Population SD <sup>a,b</sup>
Neuroticism	16	8	21	8
Extraversion	29	6	28	6
Openness to Experience	33	6	28	6
Agreeableness	36	5	32	6
Conscientiousness	35	6	33	6
<b>PPT</b>				
Performance SRTN	3.93	5.06		
Perceptual SRTN	2.29	3.78		
PPDIS	1.64	2.61		

**Table 3.** Comparison of means and standard deviations for NEO-FFI-3 domains and PPT between study participants and those reported by the respective test developers. <sup>a</sup> NEO-FFI-3<sup>3</sup>: Form S (self-report), adults  $\geq 21$  years, combined (N = 465) male (N = 279) and female (N = 356). <sup>b</sup> PPT:

## CONCLUSIONS

- These findings do not support our hypothesis in that Extraversion, Agreeableness, and Neuroticism domains were not associated with either under- or overestimation of speech recognition in noise. While Openness to Experience did show a small positive correlation to overestimation, this would likely diminish when removing controls for age and better ear PTA.
- Our findings suggest that that variability in PPDIS scores are explained by factors other than personality. Further, the lack of any significant correlations between personality and Performance and Perceptual SRTN also suggests that personality does not account for variability in objective and subjective assessment of speech perception in noise.
- Our findings do not support the efficacy of personality assessment for the purpose of pre-identification of those who will likely perceive reduced hearing aid benefit.

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