Exploring the Relationships Between Sound Acceptability, Emotional Reactivity, and Personality

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Introduction

Negative reactions to amplified sounds are one of the primary causes of hearing aid rejection. Although some clinical protocols assess specific reactions to certain types of sounds (e.g., discomfort from loud sounds, tolerance of loud background noise), many hearing aid users find it difficult to accept amplified sounds of varying levels and characteristics in daily listening. Some research suggests that personality traits like Neuroticism and Openness are related to aspects of sound acceptability and amplification outcomes (Franklin et al., 2013; Sarangi, 2019; Shepherd et al., 2015). It also seems likely that reactions to daily sounds could be emotionally driven. However, the relationship between emotional reactivity and sound acceptability has not been studied. It is not currently clear how individual characteristics like personality and emotional reactivity are related and how they may impact sound acceptability. This research was designed to clarify these relationships for young adults with normal hearing.

Aims

The current research study aimed to:

- Evaluate the relationship between measures of emotional reactivity and personality.
- Evaluate the relationships between measures of emotional reactivity and personality, and ratings of non-speech sound acceptability.
- Determine if emotional reactivity improves the ability to predict sound acceptability ratings.

Hypothesis

We anticipated individuals with higher ratings of positive personality traits would also report having higher positive emotional reactivity and higher ratings of sound acceptability.

Methods

- 53 self-reported normal hearing young adults participated in this exploratory survey study (*M* age=22.36 years; 39 female).
- Participants completed an online survey comprising demographic questions, the International Mini Markers (Thompson, 2008) personality test, the Perth Emotional Reactivity Scale (Preece et al., 2018), and a digitized form of the Sound Acceptability Test (SAT; Johnson, 2012) .
- The SAT was developed to assess hearing aid users' acceptance of sounds of varying intensity and duration. This test comprises standardized live presentations of 21 real-world sounds (See Table 1). Listeners rate the acceptability of these sounds using an 11-point Likert scale. To allow for remote testing during the COVID-19 pandemic, these standardized sounds were recorded for presentation in an audio/visual format that we refer to as the Digital-SAT.
- Digital-SAT files were calibrated relative to a 65 dB SPL speech passage. Participants were instructed to adjust their device volumes so that this passage was "Comfortable." Digital-SAT sounds were presented in two randomized blocks, with each sound represented once per block. The ratings for each sound were averaged and combined for each of the 9 sound categories depicted in Table 1.

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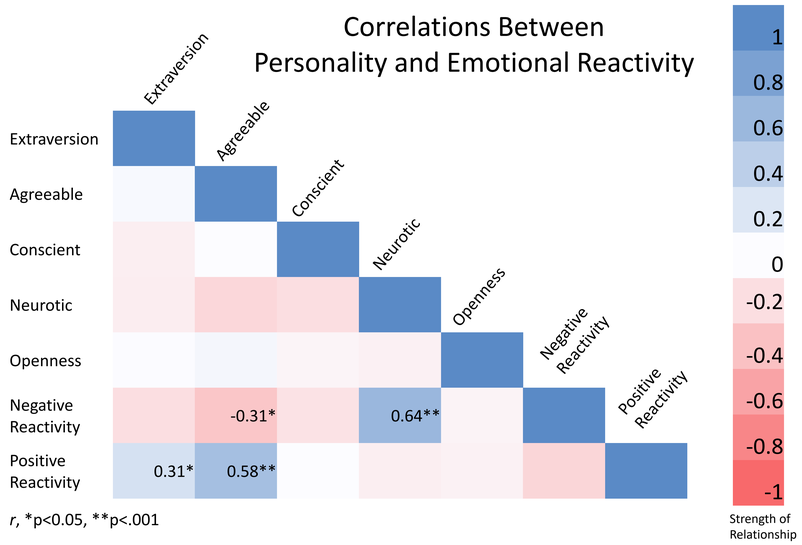
Sound Acceptability Test Everyday Sounds		Duration: Transient (≤1 sec)	Duration: Episodic (1-5 sec)	Duration: Continuous (>5 sec)
Intensity	Soft (<55 dB SPL)	Clicking Pen Keyboard Typing	Shuffling Cards Cutting Paper	Electric Fan Pen Scribble
	Average (55-75 dB SPL)	Pen Tapping Door Bang	Phone Ring Rattling Paper	Hair Dryer Coffee Grinder
	Loud (>75 dB SPL)	Clattering Dishes Hammer Desk Bell	Silverware Rattling Keys* Bike Bell*	Vacuum Drill Marbles

Table 1. *These sounds did not meet targeted intensity levels due to digital peak clipping limits.

Scan to access the Digital SAT



As expected, ratings of positive and negative personality traits tended to be directly related to their corresponding measures of emotional reactivity and inversely related to opposite emotional reactivity, although only a few of these relationships were statistically significant. See *r* values above.

Correlations Between Personality, Emotional Reactivity, and Sound Acceptability

	Extraversion	Agreeable	Conscient	Neurotic	Openness	Negative Reactivity	Positive Reactivity
Transient Soft							
Transient Avg							
Transient Loud		0.3*				-0.31*	
Episodic Soft							
Episodic Avg		0.37**					
Episodic Loud		0.27*					
Continuous Soft							
Continuous Avg							
Continuous Loud							

An additional regression analysis revealed that Agreeableness was positively related to acceptance of Transient Loud, Episodic Average, and Episodic Loud sounds. Negative Reactivity was negatively related to acceptance of Transient Loud sounds (above).

Hierarchical Regression

Step 1: Negative Reactivity
Step 2: Negative Reactivity + Agreeableness

	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
Soft	0.01	0.05	0.01	0.05	0.06	0.03
Average	0.01	0.04	0.01	0.14**	0.04	0.04
Loud	0.10	0.14**	0.04	0.09*	0.07	0.10*
	Transient		Episodic		Continuous	

R^2, **p<.05, *.05<p<1.0

Because negative emotional reactivity and the Agreeableness personality dimension had the strongest relationships to acceptability of various sound domains, these variables were entered into a hierarchical regression analysis. Negative Reactivity was entered at Step 1 and Agreeableness was entered at Step 2. When considered together, these two dimensions were able to explain a very small amount of variance in participants' acceptability ratings, especially for loud sounds (above).

Discussion

For these young adults with normal hearing abilities, components of emotional reactivity and personality had a slight relationship with acceptability of nonspeech sounds, particularly for loud sounds of all durations. It is rather unsurprising that these participants mostly found everyday sounds very acceptable given their typical hearing abilities. Although clustering in the data may have obscured potential influences of these factors for these individuals, these subtle effects of personality and emotional reactivity might be more impactful for new hearing aid users as they adjust to perceived negative qualities of amplified sounds.

Limitations

Due to the remote nature of the study, it is unknown if participants accurately calibrated the volume on their devices, were in a quiet environment, or kept the volume at a consistent level as instructed. The SAT was not designed to be presented digitally, and therefore limitations of recordings and loudspeakers may have influenced the results.

Conclusions

Emotional reactivity and aspects of personality are related, and together can account for a small amount of variance in sound acceptability ratings for young normal hearers. These subtle, preliminary findings provide a rationale for further investigation of the impact of these variables on amplified sound acceptability for hearing aid users.

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