

Survey of Rehabilitation Practices for Normal-Hearing Patients with Auditory Difficulties

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Research Article

A Questionnaire Survey of Current Rehabilitation Practices for Adults With Normal Hearing Sensitivity Who Experience Auditory Difficulties

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Keeping things legal

- No financial conflicts of interest
- The information presented and the opinions expressed herein are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs, Department of Defense, or the United States government

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It is not uncommon to encounter patients in the clinic who report significant communication difficulties but who present with normal or near-normal pure-tone hearing sensitivity.

Audiologists are starting to use both bottom-up and top-down approaches for treating this clinical population.

However, there is currently no evidence-based, standardized, or agreed upon rehabilitation protocol available.

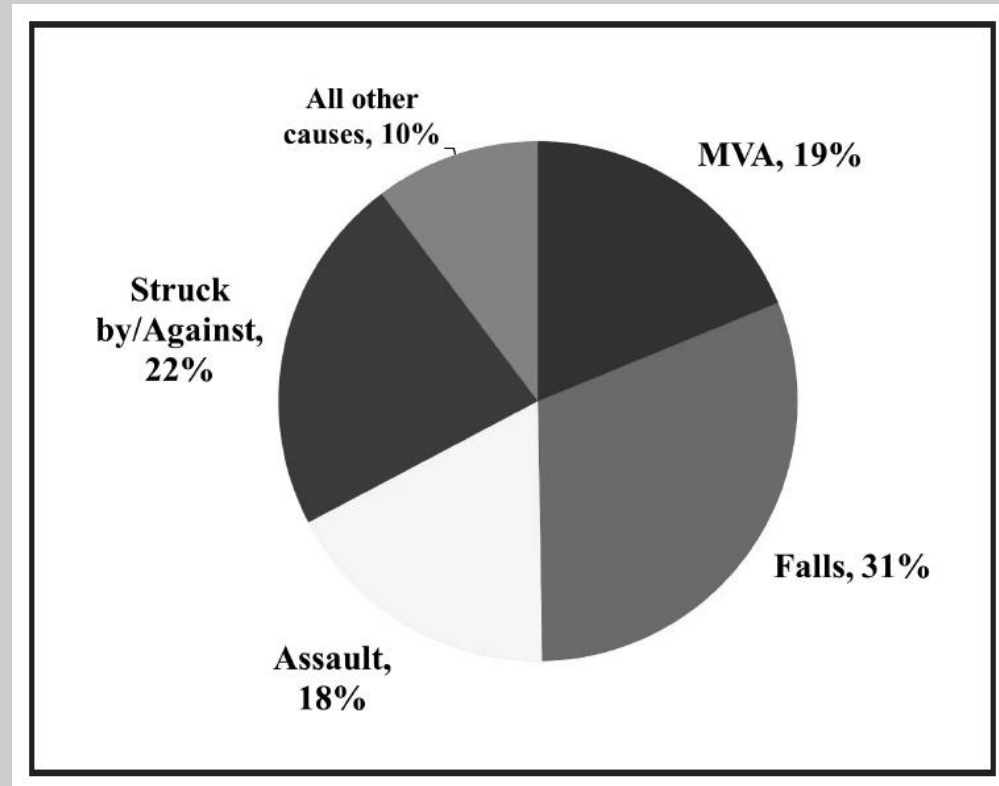


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e.g., Billings et al. (2018). *JAAA*
Parthasarathy et al. (2020). *eLife*
Edwards (2020). *Seminars in Hearing*

Adult Patients

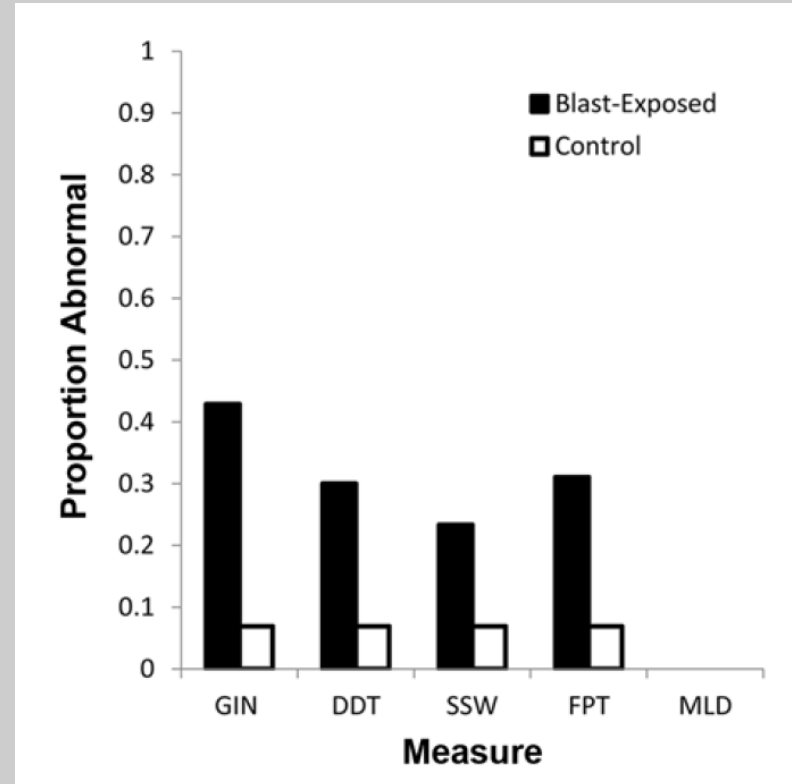
- Blast exposure and traumatic brain injury (TBI):
 - A high prevalence of normal-hearing individuals with a history of mild TBI report auditory difficulties



Papesh, Theodoroff, & Gallun (2018)
Tepe et al. (2020)

Adult Patients

- Traumatic brain injury (TBI) can result in damage throughout the central nervous system
- Studies have shown TBI-related deficits on behavioral and electrophysiological tests of central auditory processing



Outline

- Review literature on the effects of different rehabilitation methods for individuals with communication difficulties and normal or near normal pure-tone hearing sensitivity
- Report results from a survey of audiologists on current rehabilitation practices being used for this population in the clinic
- Discuss current and planned research being conducted the VA RR&D NCRAR on this topic

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Background: types of rehab strategies

- Improvement of the the signal-to-noise ratio (SNR)
 - Hearing Aids
 - FM system
- Auditory & Cognitive Training
- Counseling

Background

Roup et al. (2018)

4-week hearing aid trial:

Bilateral receiver-in-the-canal aids

- Open domes
 - Adaptive multiband directional microphones
 - Multiband noise reduction
 - Widex “speech enhancer” technology
-
- 5-10 dB of insertion gain between 1-4 kHz
 - No gain for loud inputs

Table 1. Mean insertion Gain (and Standard Deviations [SD]) for 1000–4000 Hz for Right and Left Ears

	Frequency in Hz			
	1000	2000	3000	4000
Mean (SD)				
Right ear	3.6 (1.4)	9.4 (2.6)	11.1 (2.8)	7.2 (3.1)
Left ear	3.6 (1.9)	10.2 (2.4)	11.5 (2.5)	7.6 (3.1)



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Background

Roup et al. (2018)

Compared to a pre-fit unaided condition, results showed that use of mild-gain hearing aids can:

- Reduce self-reported hearing handicap (HHIA)
- Reduce self-reported auditory processing difficulties (APQ)
- Improve measured speech perception in noise (R-SPIN)

- 67%: helped in quiet, 71%: helped in noise

- Only 3 participants chose to purchase the hearing aids after the 4-week trial.



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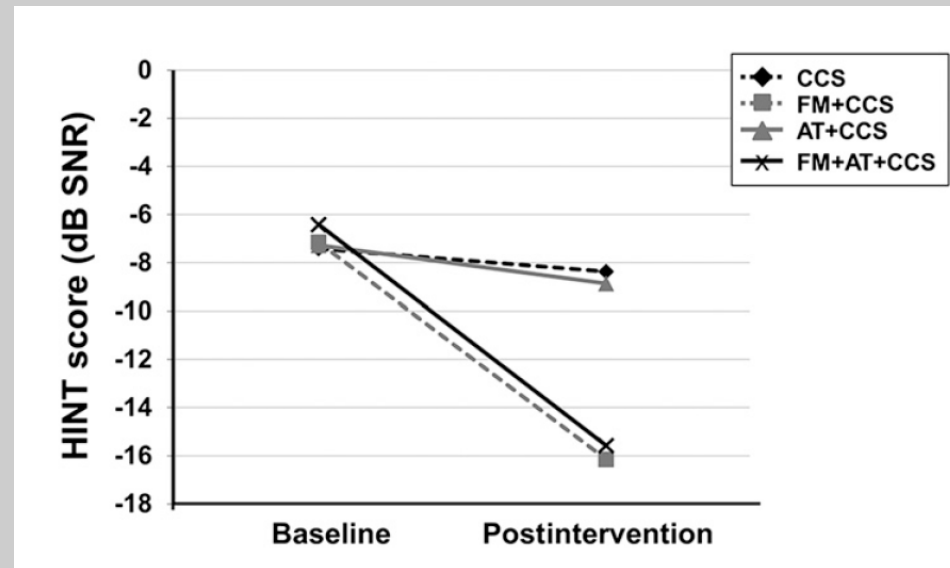
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Background

Saunders et al. (2018)

- Compensatory Communication Strategies (CCS) counseling
 - 10-15 minute one-on-one session with Audiologist
 - Auditory processing, communication strategies, and hearing conservation
- Personal Frequency Modulation (FM) System
 - Phonak receiver and transmitter
- Auditory Training (AT)
 - Computer-based program: Brain Fitness Program of Posit Science
 - 1 hr. per day, 5 days per week (40 hrs. total)



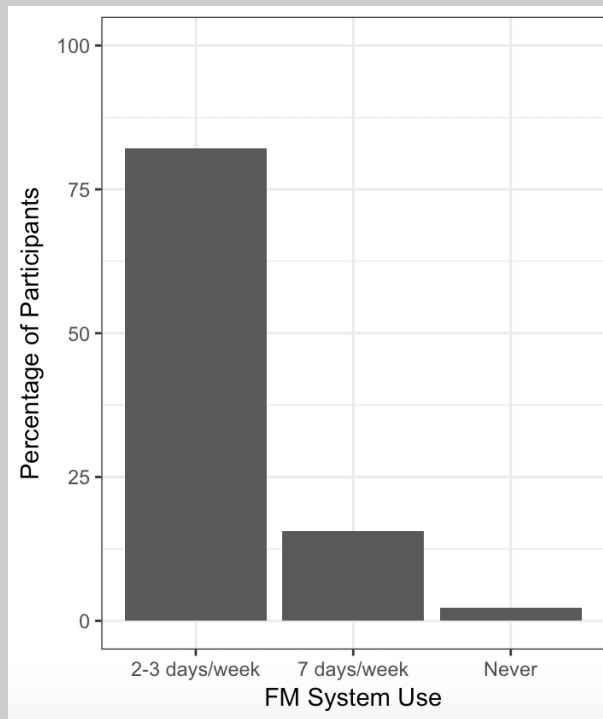
Background

Saunders et al. (2018)

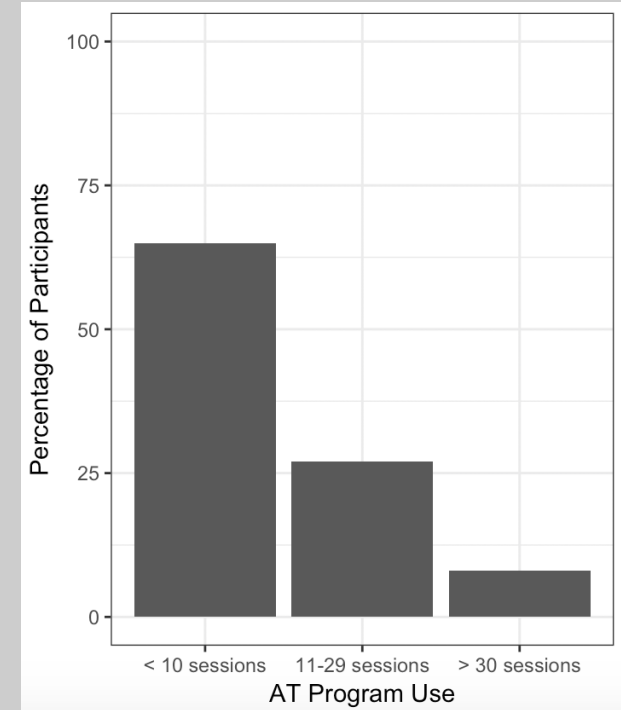
Compliance:

- Counseling: 74.7% read the brochures, but less than 50% found them useful or even reported using the suggestions

- FM:



- AT:



Background

Additional Studies

FM systems:

- Johnston et al. (2009): children
- Sharma et al. (2012): children

Hearing Aids:

- Roup et al. (2019): adult – case report
- Kokx-Ryan et al. (2017): adults with blast injury
- Kuk et al. (2008): children
- Smart et al. (2007): adults – 2 case reports

Auditory training:

- Loo et al. (2016): children
- Sharma et al. (2012): children



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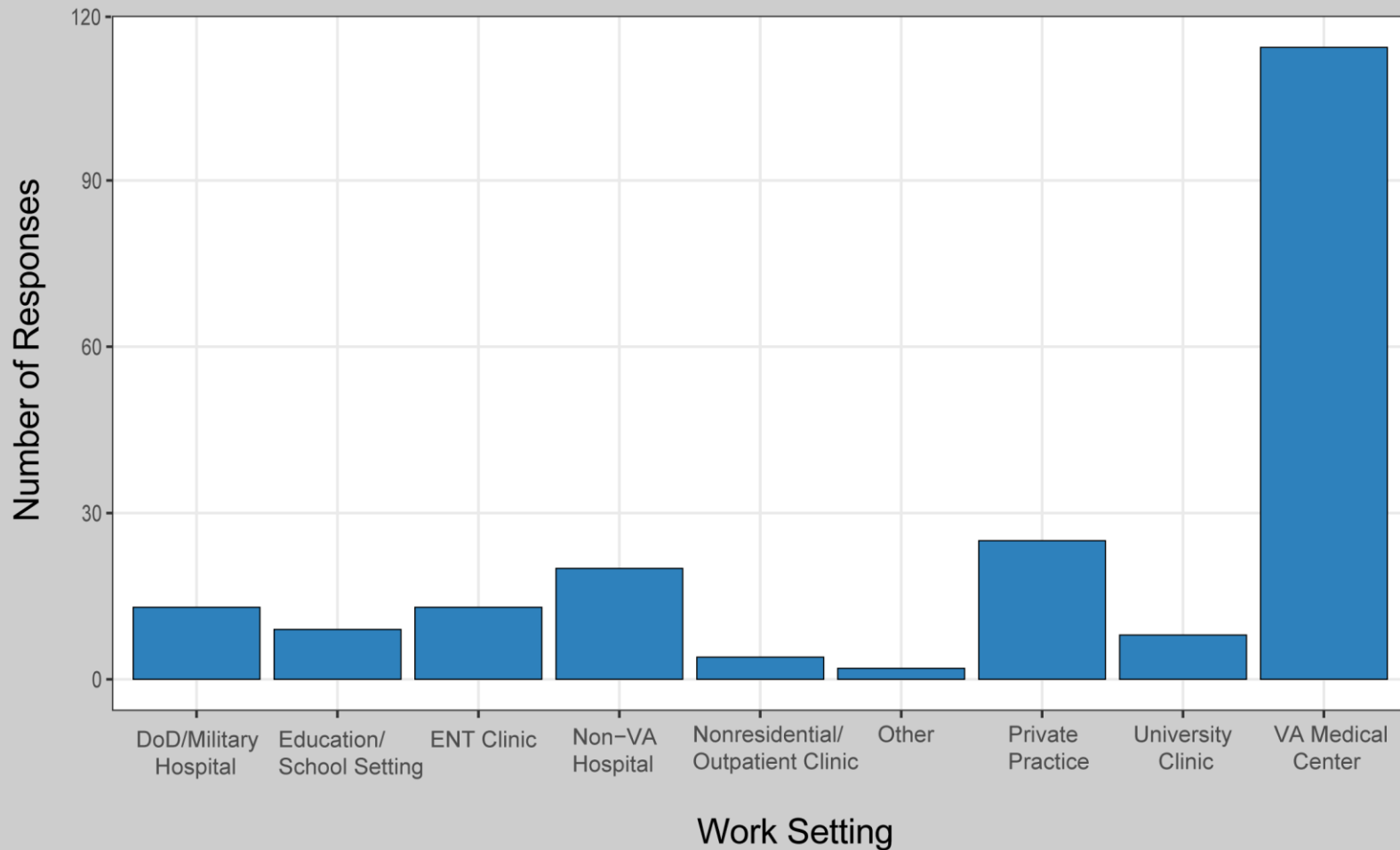
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Purpose

- Determine how audiologists across various work settings currently treat individuals with normal hearing and auditory complaints
- Gain information about how well audiologists feel these treatments are working for this patient population
- Use survey results to design methodology for performing a randomized control trial for assessing the effects of various treatment options

Results



Total Number of Survey Responses (n = 209)

Number of Non-VA/DoD Responses: 81

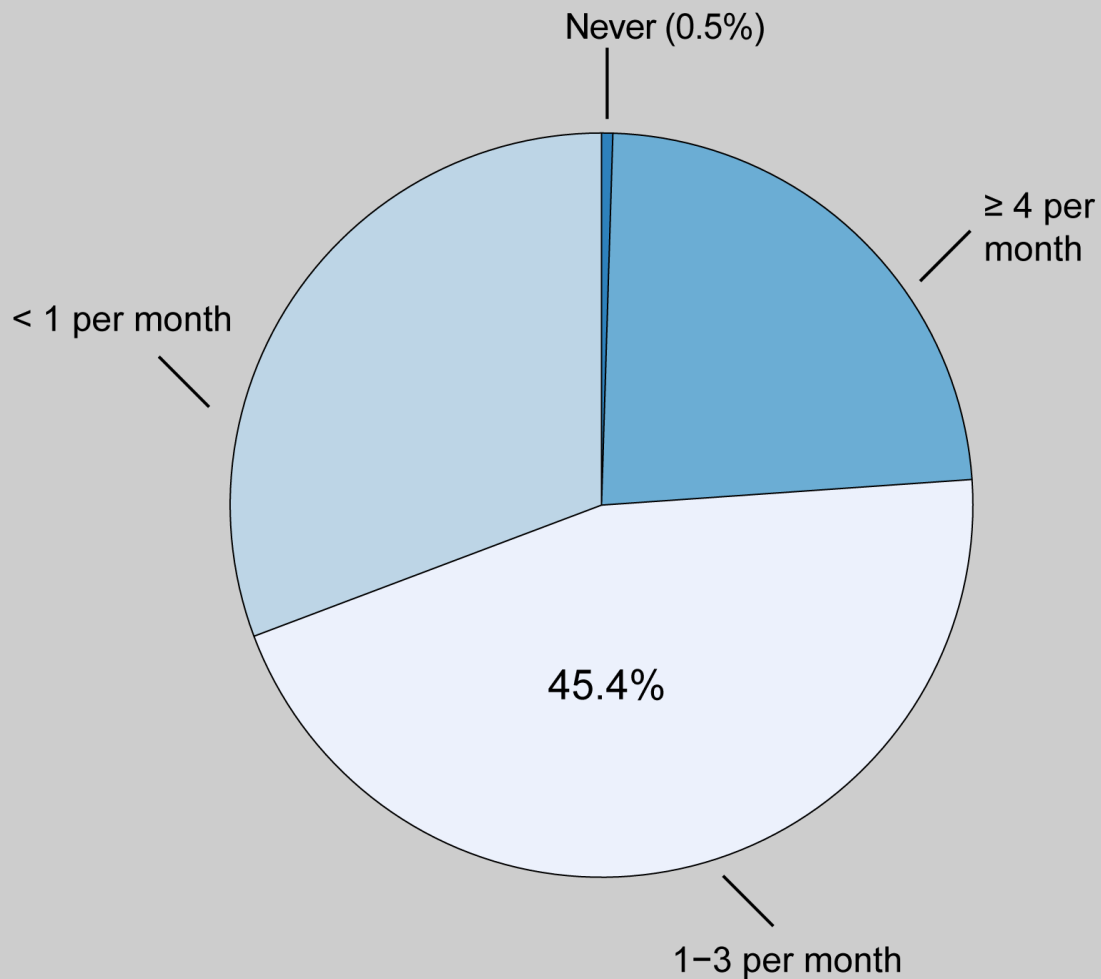


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Results

How often do you encounter patients who have communication difficulties despite having normal or near normal pure-tone hearing thresholds?



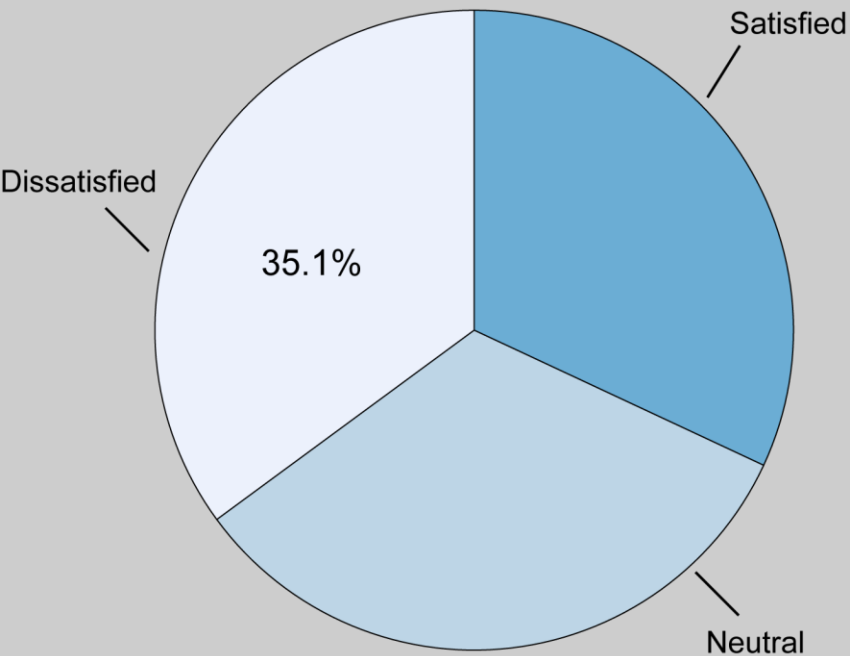
n = 205



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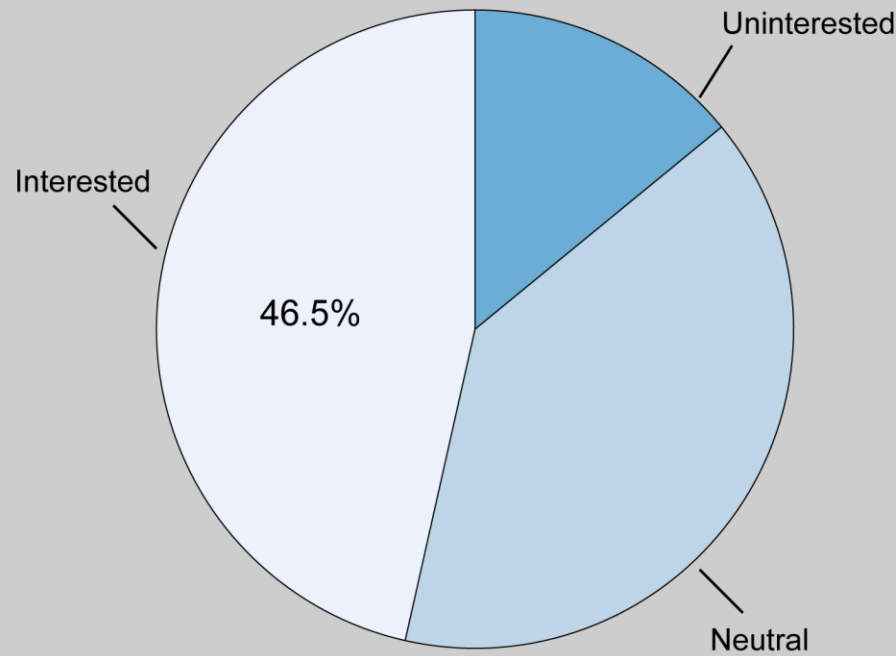
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Do you find that patients are satisfied or dissatisfied with after finding out that they have clinically normal hearing thresholds?



n = 191

Do you find that these patients are interested in the treatment options you discuss with them?



n = 142



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What hearing-related issues do you....

...think are the most important to address for these normal-hearing adults?

...most frequently attempt to address for these normal-hearing adults?

...find are most amenable to alleviation by your preferred rehabilitation options?

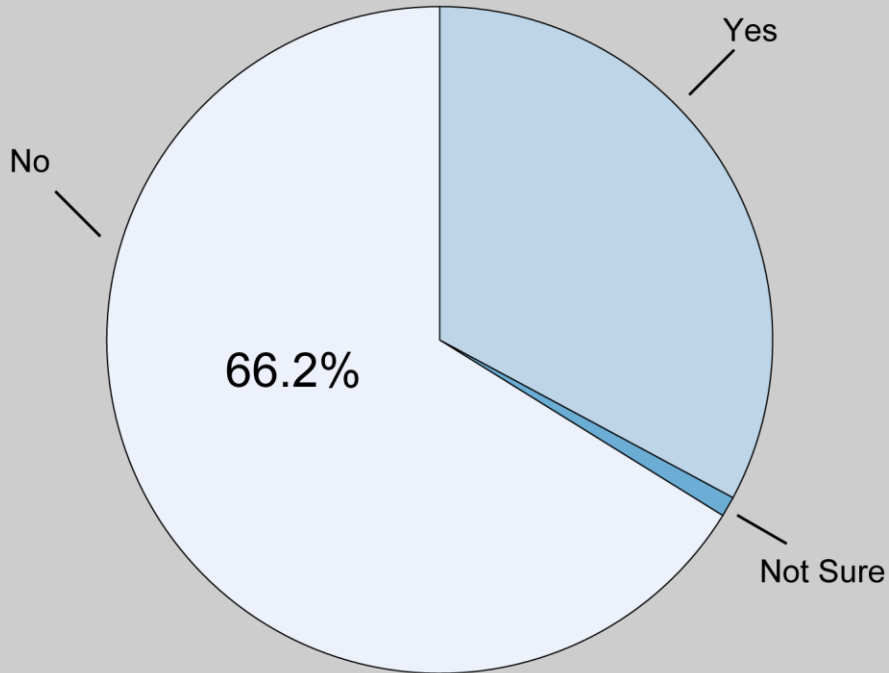
Speech Understanding	137 (88.4)	124 (81.0)	104 (72.2)
Intolerance of Noisy Environments	90 (58.1)	83 (54.2)	54 (37.5)
Tinnitus	63 (40.6)	71 (46.4)	61 (42.4)
Hyperacusis	28 (18.1)	17 (11.1)	9 (6.3)
Other	10 (6.5)	4 (2.6)	9 (6.3)
	n = 155	n = 153	n = 144



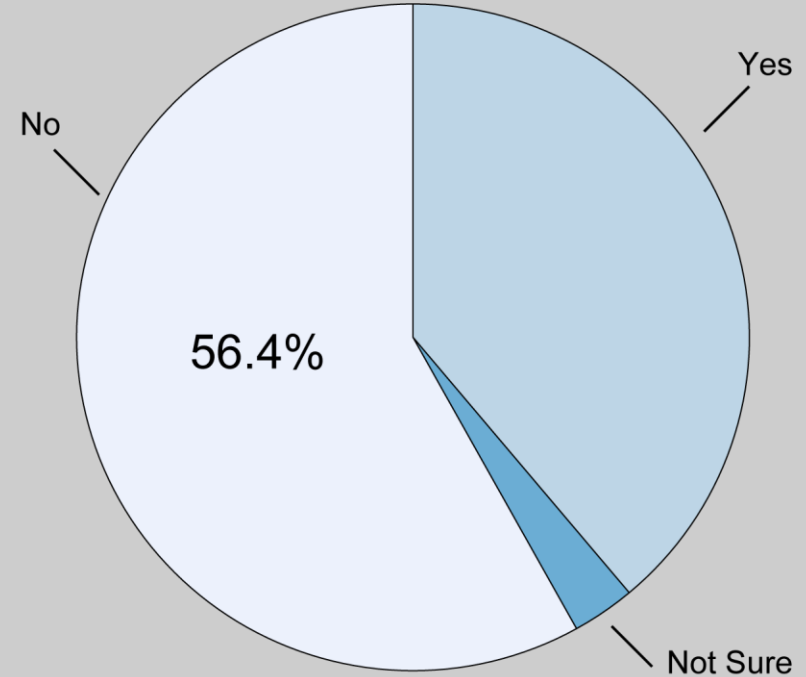
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Does your work setting have an APD clinic or APD specialist?



Does your work setting have an APD protocol/model?



n = 204

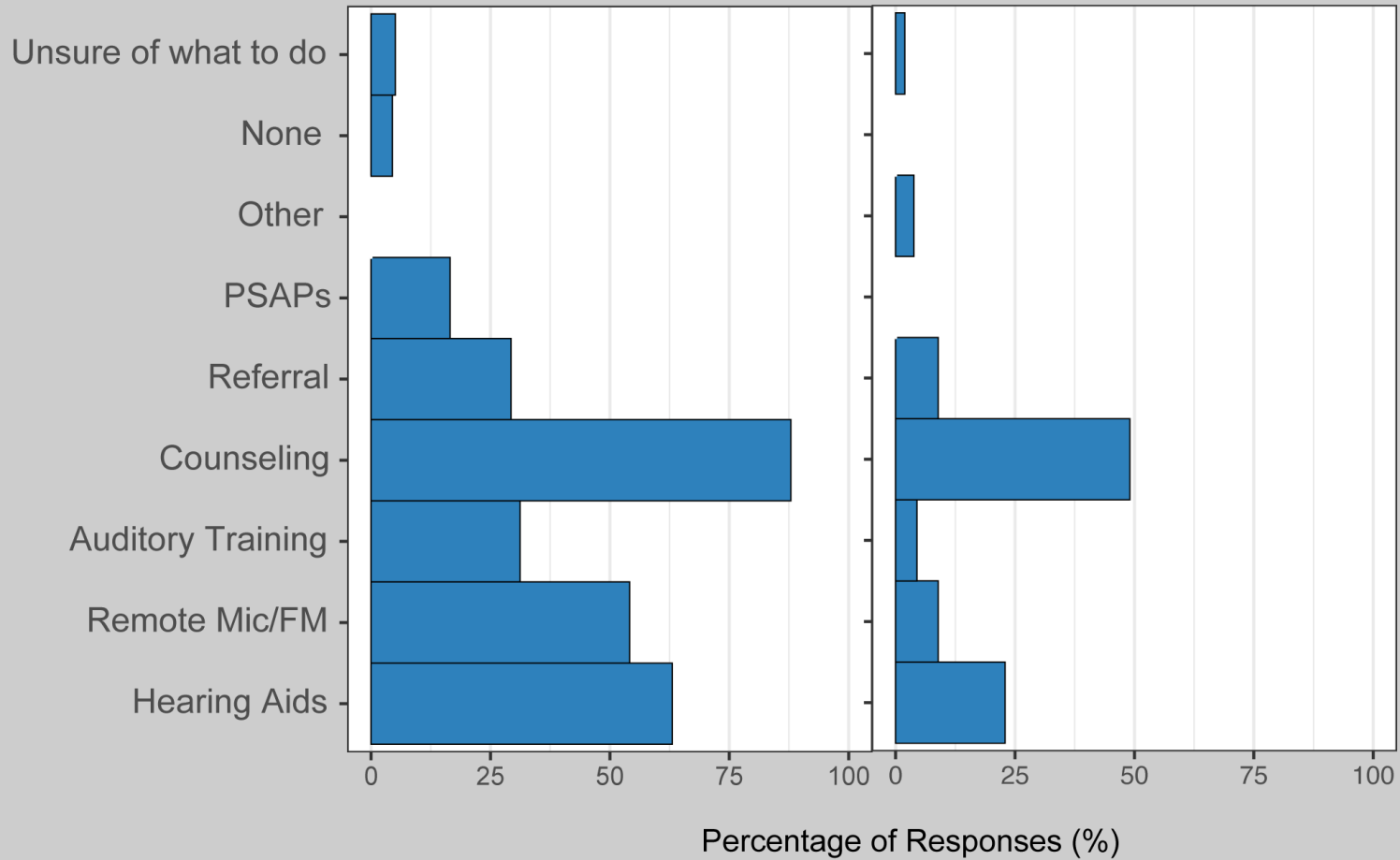


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What types of rehabilitation options do you offer?

What is your preferred rehabilitation strategy?



n = 157

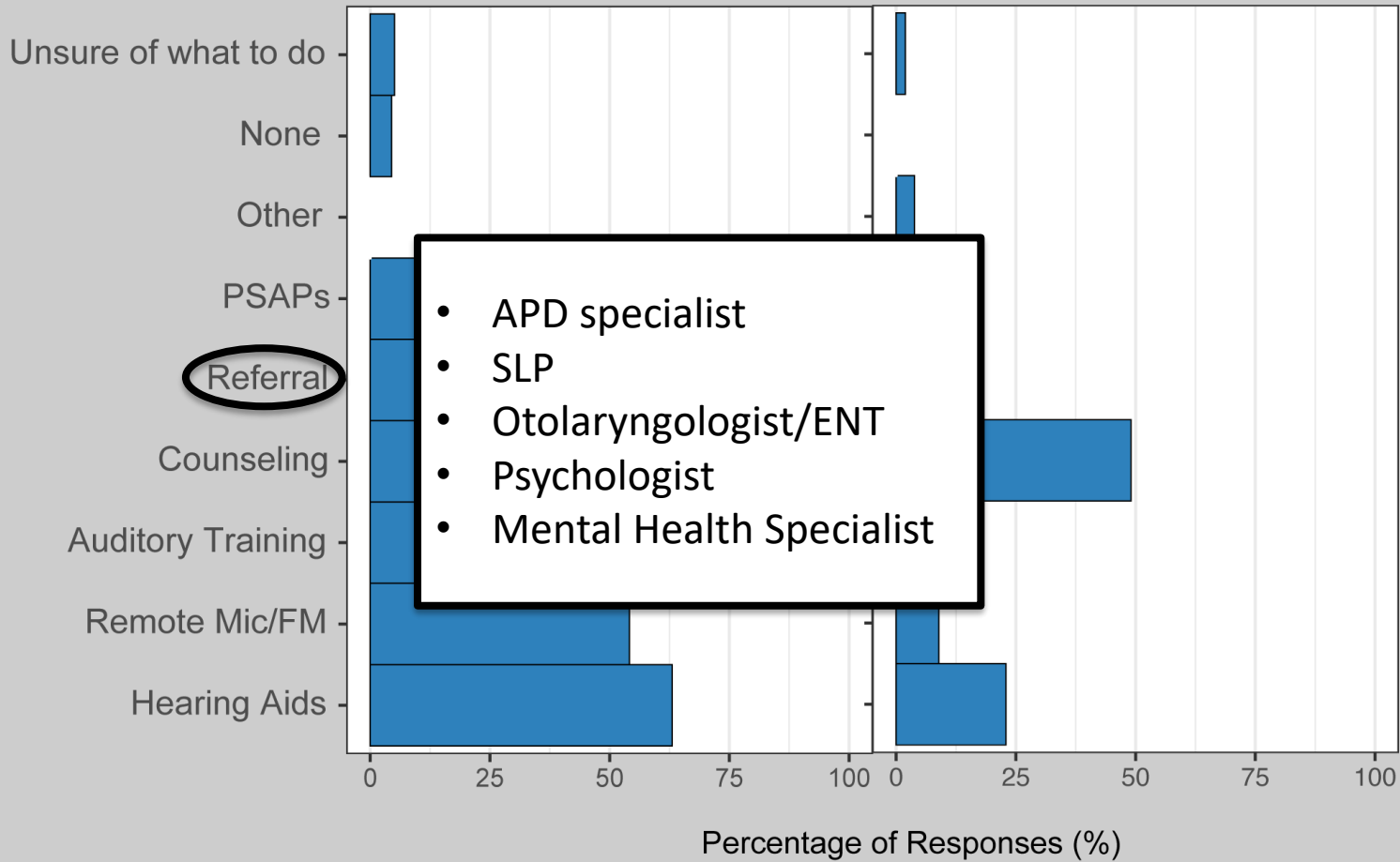


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What types of rehabilitation options do you offer?

What is your preferred rehabilitation strategy?



n = 157



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Results

Fitting Hearing Aids

- Bilateral, open-fit, receiver-in-the-canal hearing aids
- Mid- to high-end devices
- Majority start fitting the hearing aids using a prescriptive formula:
 - Patients tend to prefer slightly more gain than provided by prescriptive targets in mid-frequencies
 - 5-10 dB insertion gain at mid- to high-frequencies
 - Minimize maximum power output (MPO)

n = 106-108

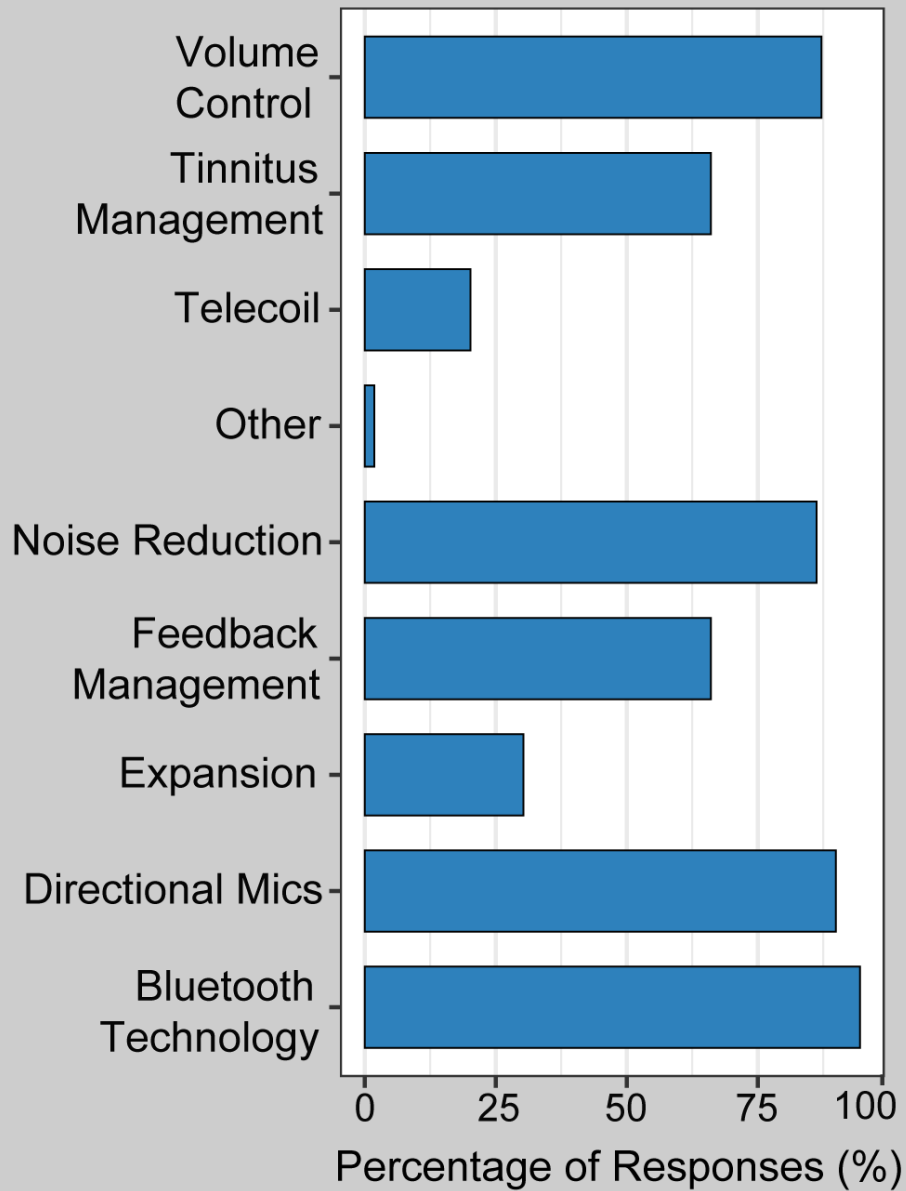


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What hearing aid processing features have you activated/provided for these adults?



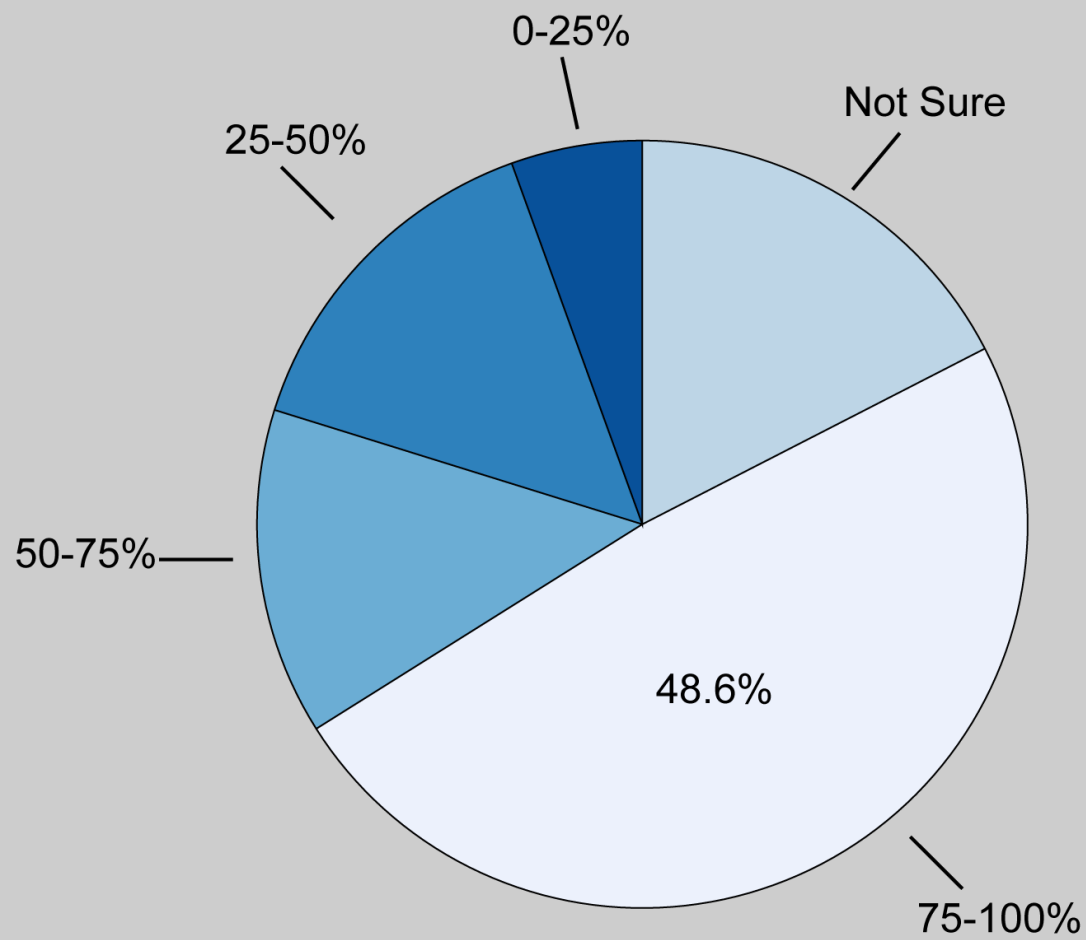
n = 109



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How many patients keep the hearing aids?



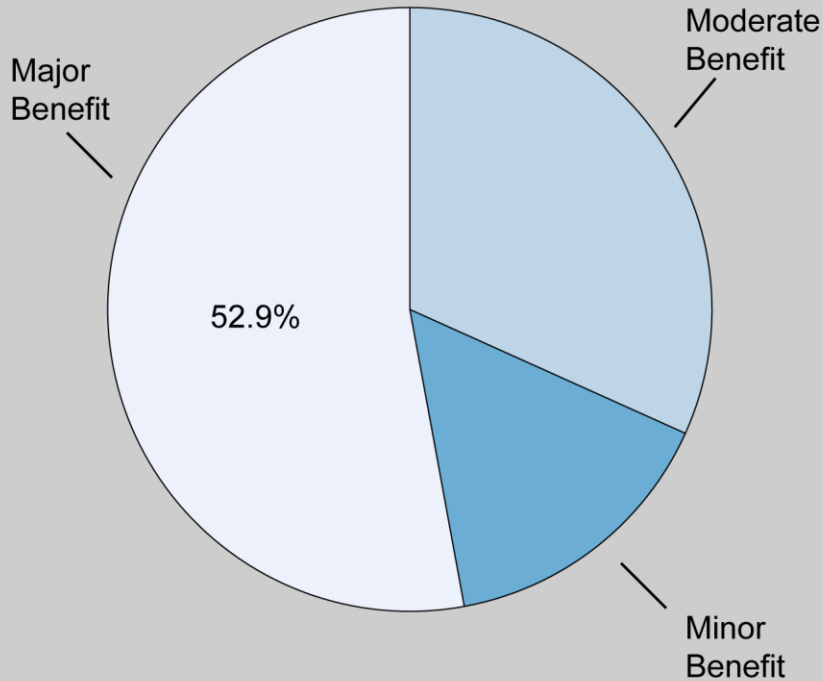
n = 109



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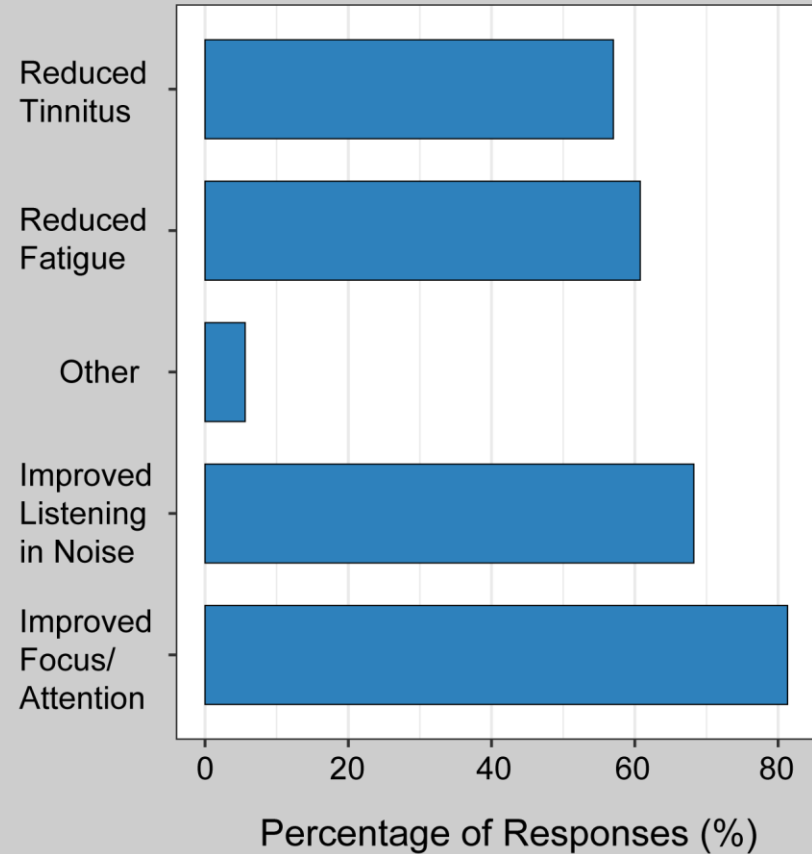
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Do you feel that these adults receive benefit from the hearing aids?



n = 104

How do these adults with normal hearing thresholds say that they benefit from the hearing aids?



n = 107



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Additional Comments on Hearing Aids:

- “Family reports significant improvement in personality and communication...”
- “I feel like my APD patients are my most loyal hearing aid wearers...often 14 hrs. per day”
- “I have never, in almost 20 years, have had anyone return their devices, in fact they return stating that their lives are much improved...”
- “...most don’t feel the cost of aids is worth it”
- “...feel like it is a case by case basis and am not completely sure they are obtaining significant benefit for speech understanding...”
- “They don’t return the hearing aids but also don’t tend to wear them either.”



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Additional Comments on Hearing Aids:

- “Gotta live outside the box sometimes.”
- “I would LOVE to have a national protocol or even a local one, but everyone is afraid of touching the idea.”
- “Need for a protocol!”



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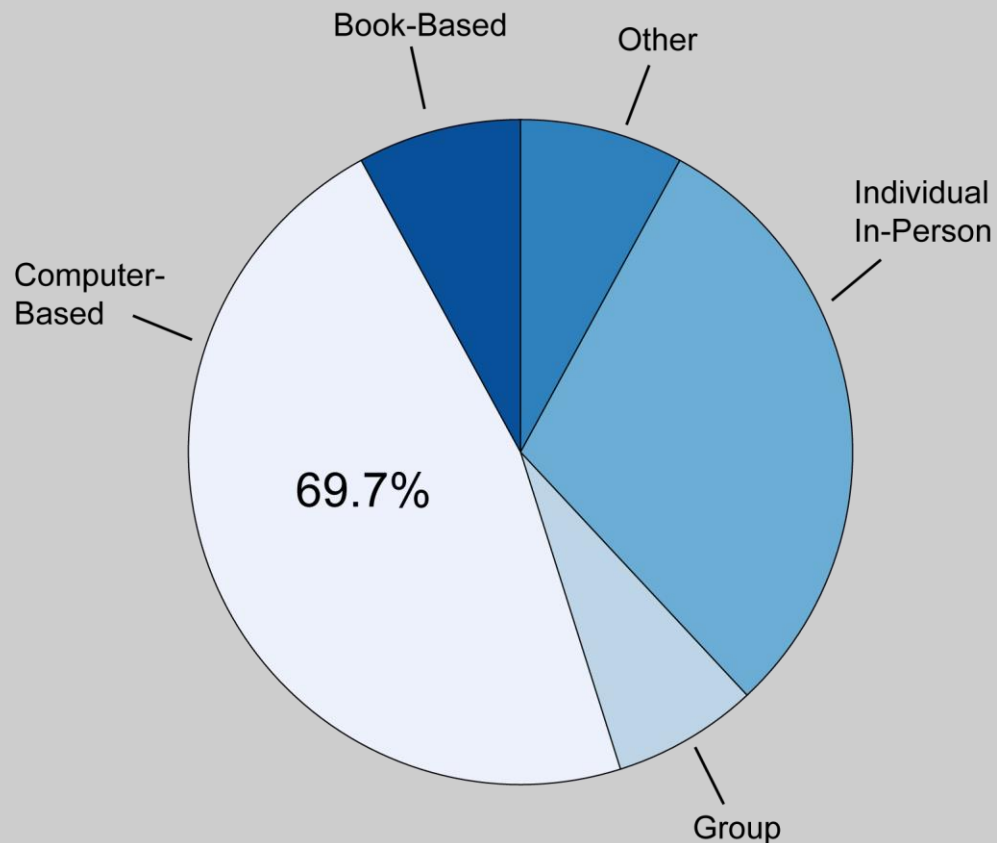
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Results

Auditory Training

What types of training programs do you suggest or provide for these adults?



- Listening and Communication Enhancement (LACE)
- Angel Sound
- cLEAR
- Hear Coach listening games (Starkey app)
- Read My Quips
- Referral to SLP

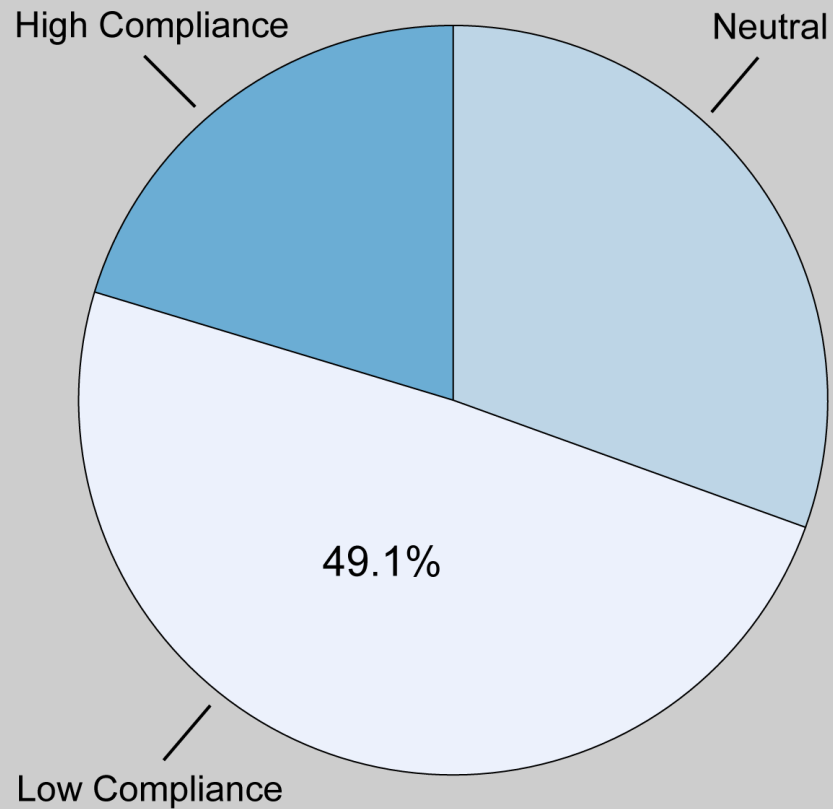
n = 76



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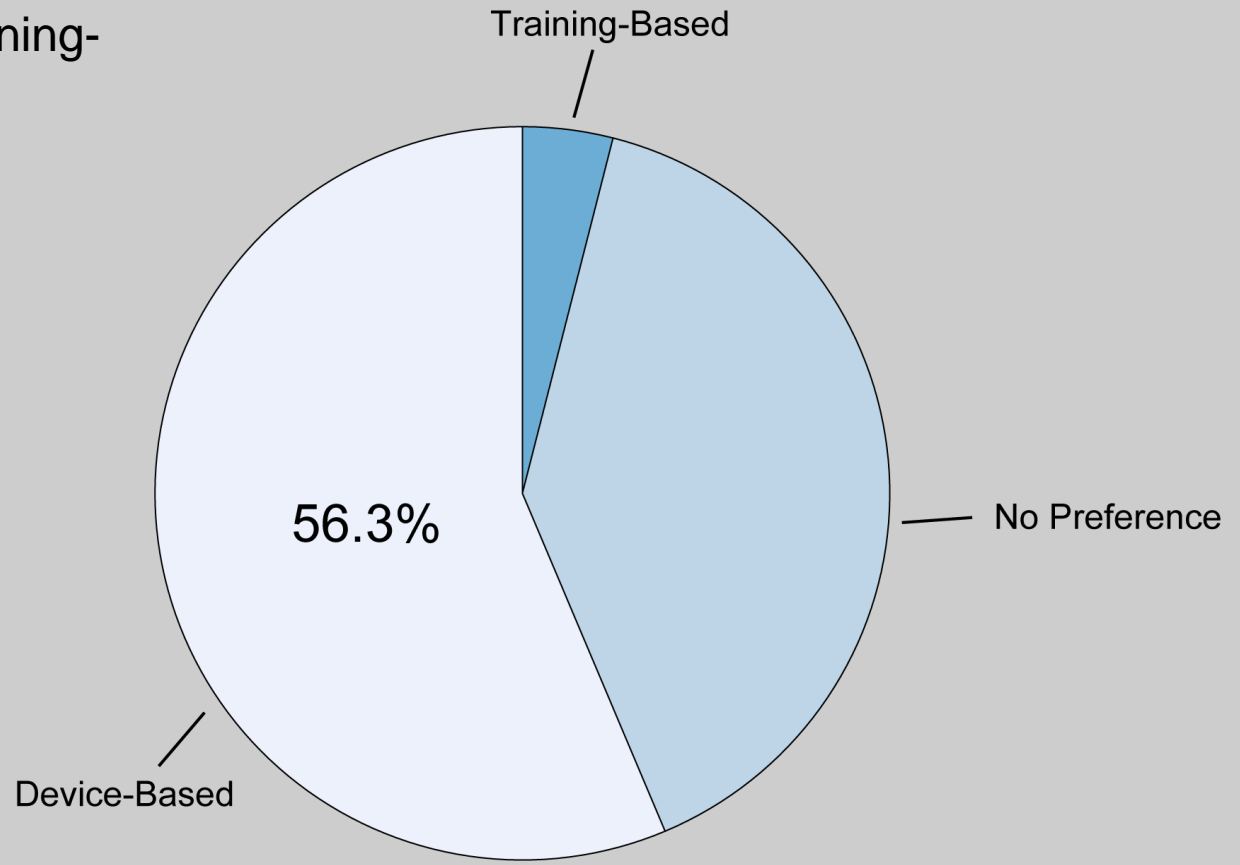
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How compliant are patients with sticking to the recommended auditory training protocol (i.e. do they complete the recommended number of sessions or hours of training)?



n = 59

Do you think that these adults have any preference between device-based and training-based rehabilitation?



n = 126



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Results

Comparison across VA/DoD and non-VA/DoD audiologists

Question	χ^2	p-value
2: How often do you encounter patients who have communication difficulties despite having normal or near normal pure-tone hearing thresholds?	1.32	0.52
3: If you have encountered this type of patient in the clinic, do you find that they are satisfied or dissatisfied with the appointment after finding out that they have clinically normal hearing thresholds?	4.05	0.13
7: Does your work setting have an APD clinic or APD specialist?	1.45	0.23
8: Does your work setting have an APD protocol/model?	0.99	0.32
9: If you have encountered adults with normal hearing thresholds who have difficulties understanding speech, what is your preferred rehabilitation strategy (please select only one)?	0.00	1.00
12: Do you find that these patients are interested in the treatment options you discuss with them?	3.07	0.21
21: How many of these adults keep the hearing aids? *	0.06	0.81
22: Do you feel that these adults receive benefit from the hearing aids?	1.97	0.16
27: How compliant are patents with sticking to the recommended auditory training protocol?	0.07	0.96
30: How confident do you feel that there are rehabilitation options that work for these adults?	1.24	0.54



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Summary

- A considerable number of individuals are seeking hearing health care for communication difficulties despite having normal or near-normal pure-tone hearing thresholds
- A high proportion of patients are generally interested in treatment options
- Audiologists most frequently perform counseling for treatment, but are also successfully starting to fit low-gain hearing aids
- Fewer audiologists are suggesting auditory training options, likely due to low compliance with these methods
- Methods are being individualized for patient needs: one strategy might not work for all patients



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Current & Future Directions

Rehabilitation:

- T. Zaugg (VA RR&D SPIRE): *Feasibility and Acceptability of Using Low-Gain Hearing Aids for Bothersome Tinnitus*
- F. Gallun (NIH R03): *Brain Training for Central Auditory Dysfunction After Traumatic Brain Injury*



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Current & Future Directions

Identification and Assessment:

- T. Koerner (VA RR&D Career Development Award-1):
Mechanisms of Impaired Speech Perception in Veterans with Non-Blast TBI
- M. Papesh (VA RR&D Career Development Award-2):
Physiological Assessment of Auditory Processing Disorders in TBI

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