Understanding Auditory Difficulties Among Veterans

Expert Q & A

Gabrielle Saunders, Ph.D.

It is commonly known that hearing loss and tinnitus are among the most common consequences of combat and the number of veterans receiving compensation for those conditions has risen significantly as a result of U.S. involvement in the Middle East (Gulf War, Operation Iraqi Freedom (OIF)/Operation Enduring Freedom (OEF)/Operation New Dawn (OND)). However, Innovations met with Gabrielle Saunders, Ph.D., to discuss one of the most perplexing problems facing VA audiologists; the increase in veterans complaining of auditory difficulties with normal or near normal hearing, at least as measured audiometrically.

IN (Innovations): How common are auditory difficulties with normal or near normal hearing (i.e. prevalence)?

GS (Gabrielle Saunders): This problem was first noticed by VA audiologists a few years back. They were encountering OIF/OEF/OND veterans who were complaining of hearing problems in "difficult listening" situations, but who had normal or almost normal hearing sensitivity. To find out more about the prevalence of this, and also about the interventions provided, my research team and I conducted an informal survey of VA audiologists. We asked them how many such individuals they were encountering each month. We learned that 92 percent encountered at least one OIF/OEF/OND veteran each month who had difficulties hearing and yet had normal or almost normal pure tone sensitivity, 53 percent reported encountering between one and three per month, and 39 percent encountered four or more per month. Based on combing data of several studies, Saunders and Echt (2012) estimate that 66 percent of veterans with deployment-related traumatic brain injury (TBI) and blast exposure complained of auditory difficulties, and that of these 35 to 54 percent have sensorineural hearing loss, 7 percent have conductive hearing loss and about 20 percent have "normal" or "almost normal" thresholds. Regardless of which data is considered, it seems the problem is fairly common.

IN: Fairly common, indeed. Could you describe the kinds of auditory problems these veterans are reporting?

GS: As I briefly mentioned earlier, these individuals report problems in difficult listening situations. In our study of 99 younger OIF/OEF/OND veterans with normal hearing and auditory difficulties, over half reported that it was "mostly" or "very" true that: they had difficulty understanding what others say when there is background noise, understanding what is being said on the telephone, understanding speech when it is spoken quickly, and keeping track of long conversations. Interestingly, when we compared their questionnaire data to data from older veterans with hearing impairment and to data from young individuals with normal hearing (some of whom were veterans and some of whom were not), it became clear their scores were similar to those of the older veterans with hearing impairment than they were more to the younger individuals with normal hearing (Saunders et al., 2015).

IN: Are these reported problems seen in their performance on behavioral tests as well?

GS: Yes, indeed they are. In our study, more than the expected number of participants performed one or more standard deviations below the published norms on several measures: speech understanding in noise, binaural processing, temporal resolution and speech segregation. Note that they didn't perform poorly on all skills we assessed — meaning that their deficits are task specific and don't simply reflect a global problem.

IN: These are certainly intriguing findings. How, then, do you explain the existence of such problems and test results in the presence of near-normal hearing?

GS: It is thought these difficulties are associated with central auditory processing problems rather than with the peripheral auditory system. Indeed, the tests on which many veterans performed below the norms are tests that others have demonstrated to be sensitive to auditory processing deficits. All of the individuals in our study had been exposed to one or more blasts while in military service. It is thought that a primary blast injury (i.e. an injury caused by the high pressure wave of the blast) leads to bruising on the exterior surfaces of the brain as it moves within the skull, hemorrhaging from the tearing of surface veins, and diffuse axonal injury as neurons are sheared and stretched as they move. In particular, these injuries damage the frontal and prefrontal cortex, impacting attention and listening; the temporal cortex, impacting feature-specific auditory processing; and the parietal cortex, impacting spatial processing.

IN: Blast-induced brain injury could certainly explain the central auditory processing deficits experienced by these veterans, but could PTSD play a role in their complaints? How does that work?

GS: Yes, the situation certainly isn't as simple as described above. Data show a complex association between blast-related TBI, PTSD and various behavioral symptoms. In fact, some people argue that PTSD is the explanation for behavioral symptoms, (Storzbach et al., 2015; Belanger et al., 2011), while others have argued that blast exposure causes PTSD, which in turn results in behavioral symptoms (Elder et al., 2012). I would suggest that both PTSD and blast-related TBI can underlie these problems despite overlap in symptoms, and that the presence of PTSD does not rule out concomitant auditory processing difficulties among blast-exposed veterans.

IN: In addition to the research you've conducted, which has led to a better understanding of this phenomenon, you and your colleagues have also researched the effects of different rehabilitation strategies with this population. Can you describe the results of those studies?

GS: Sure. To give you some background, remember the VA audiologists' survey I mentioned previously? We learned that 33 percent of the audiologists were providing these individuals with an FM system, 26 percent were providing auditory training (AT), while the remainder didn't know what to suggest. We therefore decided to conduct a randomized clinical trial in which blast-exposed veterans with normal or almost normal hearing sensitivity but who reported auditory difficulties were randomly assigned to (i) receive an FM system alone, (ii) conduct AT alone, (iii) receive an FM system and conduct AT or (iv) receive standard of care (SoC). In general, we found that individuals who received an FM found it to be helpful in the expected listening situations (during work meetings, at restaurants, while riding public transport, during lectures at school, while traveling in a car and when watching TV). Not surprisingly they performed much better on a laboratory test of speech understanding in noise when using the FM than when they were not. They also reported more improvements on the Speech Spatial and Qualities questionnaire than those who did not have an FM system.

The findings were not as positive with AT. Thirty-six percent of participants in the AT-alone group dropped out of the study – this is compared to less than 10 percent in the other groups. Further, of those who remained in the study, few adhered to the recommended training protocol. Specifically, just 8 percent completed 75 percent of the recommended number of sessions, while 66 percent completed fewer than 25 percent of the recommended number of sessions. Thus, all we can conclude is that the participants did not like doing the particular training program we selected. We cannot determine whether or not the training works because an insufficient number of individuals trained.

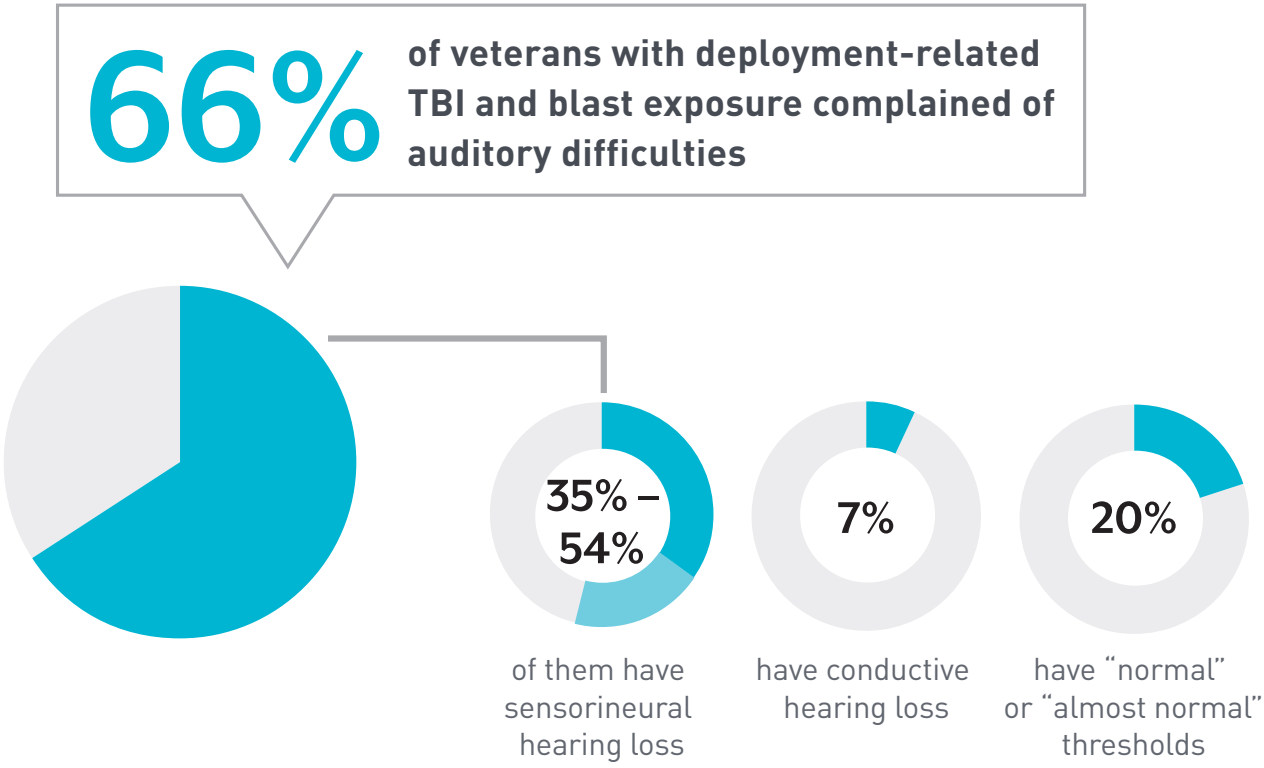
Having said this, participants who received both an FM system and AT reported the most positive outcomes on a questionnaire that assessed Attention, Executive Function, Memory, Language, Vision and Hearing, so there did seem to be some additive benefit of combining the interventions.

IN: Given what you've learned thus far, what specific interventions would you recommend for these individuals?

GS: I would, without hesitation, recommend provision of technology that improves the signal-to-noise ratio — namely an FM or Bluetooth® system. In addition, if an individual is motivated to try an AT program, then it might prove helpful. Furthermore, there is at least one ongoing study examining whether mild-gain hearing aids are beneficial for these individuals, so perhaps this will prove to be a helpful intervention also.

IN: What implications might your research have on the non-veteran population?

GS: If we are correct in our assumption that the etiology of these problems is mild TBI, then the findings are also likely to be generalizable to young adult populations with non-blast related mTBI, such as those with recreational/sports and motor vehicle injuries (Webb et al., 2015).



References

Belanger, H. G., Proctor-Weber, Z., Kretzmer, T., Kim, M., French, L. M., & Vanderploeg, R. D. (2011). Symptom complaints following reports of blast versus non-blast mild TBI: Does mechanism of injury matter? Clinical Neuropsychology, 25(5):702–15.

Elder, G. A., Dorr, N. P., De Gasperi, R., Gama Sosa, M. A., Shaughness, M. C., Maudlin-Jeronimo, E., Hall, A. A., McCarron, R. M., & Ahlers, S. T. (2012). Blast exposure induces post-traumatic stress disorder-related traits in a rat model of mild traumatic brain injury. Journal of Neurotrauma, 29(16):2564-75.

Saunders, G. H. & Echt, K. V. (2012). Blast exposure and dual sensory impairment: An evidence review and integrated rehabilitation approach. Journal of Rehabilitation Research & Development, 49(7):1043-58.

Saunders, G. H., Frederick, M. T., Arnold, M., Silverman, S., Chisolm, T. H., & Myers, P. (2015). Auditory difficulties in blast-exposed Veterans with clinically normal hearing.Journal of Rehabilitation Research Development, 52(3):343-60

Storzbach, D., O'Neil, M. E., Roost, S. M., Kowalski, H., Iverson, G. L., Binder, L. M., Fann, J. R., & Huckans, M. (2015). Comparing the Neuropsychological Test Performance of Operation Enduring Freedom/ Operation Iraqi Freedom (OEF/OIF) Veterans with and without Blast Exposure, Mild Traumatic Brain Injury, and Posttraumatic Stress Symptoms. Journal of International Neuropsychology Society, 21(5):353-63

Webb, T. S., Whitehead, C. R., Wells, T. S., Gore, R. K., & Otte, C. N. (2015). Neurologically-related sequelae associated with mild traumatic brain injury. Brain Injury, 29(4):430-7.