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FM systems as a treatment for CAPD

By Jeffrey Weibing

Using frequency modulation (FM) systems in treating peripheral hearing loss is a common practice. Research has demonstrated the efficacy of this treatment¹ and guidelines have been established for such fittings.²

However, the use of FM systems in cases of central auditory processing disorders (CAPD) has received much less attention. This is unfortunate since an FM system directly addresses one of the most common complaints of CAPD: the inability to hear in noise. Following is a brief review of the literature examining the efficacy of this CAPD treatment, primarily using case study designs. Since the review focuses on CAPD, related conditions such as learning disabilities and attention disorders are not considered.

FM treatment has been examined in both pediatric and older adult CAPD populations. Regarding children, Stach et al. present the case of a 7-year-old patient with a significant history of chronic middle ear disorder.³ His symptoms were consistent with CAPD, and included constant requests for repetition, difficulty following directions, and difficulty hearing and understanding speech. Pure-tone audiometry revealed normal hearing in the left ear and a mild sensorineural loss in the right. In quiet, his word-recognition ability was 96% bilaterally. Performance on the Synthetic Sentence Inventory (SSI) was 80% at 0 message-to-competition ratio (MCR), but showed rollover at higher intensities. ABR and MLR were normal, but the late vertex response (LVR) was absent.

With an FM system, the patient's performance on the SSI was within normal limits at -20 MCR. Unaided performance did not reach normal limits until 0 MCR. He was fitted with an FM system and, 6 months later, showed great improvements in behavior and academics.

Stach reported on an 11-year-old child with a bilateral, mild to moderate sensorineural hearing loss and a significant history of otitis media.⁴ Word-recognition scores were much better than performance on the SSI, and could not be explained by the hearing loss. Performance on the SSI at 0 MCR rolled over. Hearing aids were prescribed, but the patient complained that they made it more difficult for him to hear.

An FM system was recommended as an alternative. SSI performance with the FM was within normal limits at all MCRs, while with hearing aids it did not reach normal limits until 10 MCR or in quiet, depending on the hearing aid used.

Case studies among older adults have also shown benefits from this treatment. Stach et al. reported on an 87-year-old woman who had a moderate, sensorineural, peripheral hearing loss and CAPD.³ She had worn a hearing aid for her right ear for over 20 years, but had increasing difficulty understanding speech with

amplification, despite adequate gain. Unaided tests results showed that performance on the SSI at 0 MCR was 0% bilaterally. At +10 MCR, performance was 80% in the right ear and 46% in the left. This closely matched her word-recognition performance of 70% in the right ear and 46% in the left.

When fitted with an FM system, her SSI performance at -10 MCR was 100%, whereas with a hearing aid (right ear only) it reached normal limits only in quiet. The patient was satisfied with the FM system and reported beneficial changes in her lifestyle.

EVIDENCE IS ENCOURAGING

Although conclusions based on case studies alone should be drawn with caution, preliminary evidence for this treatment is very encouraging. Most patients, regardless of age, received considerable benefit from an FM system, as determined by SSI performance. It is extremely interesting that central auditory processing shows such large improvements following this treatment. Patients whose performance was extremely poor without an FM system achieved almost 100% performance with FM. This result warrants consideration of this treatment in patients with persistent auditory processing difficulties.

For patients with both peripheral and central hearing loss, hearing aids alone will probably not improve signal-to-noise ratio enough to overcome the central deficit. In the cases described above, increases in SSI performance were observed only when the FM system was used, not with hearing aids alone. Directional technology has improved since these cases were reported, but recent research suggests that, when both treatments are considered separately, directional microphones in hearing aids provide less benefit than FM systems.¹

Hearing aids *are* necessary for patients who show both a peripheral and a central hearing loss. However, supplementing them with an FM system may provide a benefit not otherwise attainable in this population.

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