Modality Specificity Is the Preferred Method for Diagnosing the Auditory Processing Disorder (APD): Response to Moore and Ferguson

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2 AUTHORS:

Dennis Mcfarland
Wadsworth Center, NYS Department of He…
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Anthony T Cacace
Wayne State University
100 PUBLICATIONS **1,334** CITATIONS
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additional, age-inappropriate, and specifically auditory sensory impairments of central origin is, in our opinion, an open one. Dillon et al (2014) have argued persuasively that "spatial processing disorder," as detected with the Listening in Spatialized Noise—Sentences Test (LiSN-S), may be one such instance.

Whatever the underlying sensory and cognitive elements of APD, our experiments clearly demonstrate that it is by no means a simple process to dissociate the elements of auditory and visual perception. In addition, as commented by Dillon et al (2014), the practicalities of measuring both auditory and visual performance of children in the clinic are daunting. For example, in our research we "discovered" something that is no doubt well known to visual scientists. Sound delivery to the ears can be largely controlled by the use of headphones, but directing visual stimulation to the fovea absolutely requires visual attention.

Above all else, however, we do not believe the requirement that a diagnosis of APD should be restricted to those with only specifically auditory problems is very helpful clinically. It is likely to be arbitrary (depending on what test(s) are used); it would exclude those who have genuine auditory problems if they also have visual problems; and it may be difficult, or impossible, to establish who is in and who is out.

David R. Moore
Communication Sciences Research Center, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; Department of Otolaryngology, University of Cincinnati College of Medicine

Melanie A. Ferguson
NIHR Nottingham Hearing Biomedical Research Unit, Nottingham University Hospitals NHS Trust, Nottingham, United Kingdom

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Modality Specificity Is the Preferred Method for Diagnosing the Auditory Processing Disorder (APD): Response to Moore and Ferguson

In their letter, Moore and Ferguson essentially agree with Dillon et al (their letter) and add their experience with attempting to develop multimodal tests for assessing auditory processing disorders (APDs). According to Moore and Ferguson, they found no significant correlation between threshold or variability between auditory and visual tests and state that younger children had poorer thresholds and higher variability on both tests. They also indicate that children with APD and specific language impairment (SLI) performed more poorly and showed greater variability on both auditory and visual tests (Moore et al, 2008; 2013). They concluded that APD is primarily an "attentional" problem, as indicated by the substantial variability that they observed in participants' responses to stimuli. However, there are several relevant issues here. First, the Ferguson (2013) report referenced in their letter is not publicly available at this time, is not in their list of references, and therefore, we cannot comment on it. Moreover, like Bellis et al (2008), Moore and Ferguson (2013) describe children diagnosed with APD as having poor performance on *both* auditory and visual tasks; secondly, like Bellis et al (2008), Moore and Ferguson also chose to question the logic of multimodal testing rather than addressing the legitimacy of their original APD diagnosis. This raises the issue of whether the tests they used were reliable. In other words, would their tests produce similar results in the same individuals on two separate occasions (i.e., would they have good test-retest reliability)? If not, such tests would be subject to a high degree of error and would not be useful clinically (McFarland and Cacace, 2006. This could also give the appearance of an attentional problem when, in fact, it could be one of poor reliability. Attention problems might produce variability, but so might other factors, such as too few test items, etc.

In summary, the letter to the editor and the published works of Dillon et al (2012; 2014) and Moore and colleagues (Moore et al, 2010; Moore and Hunter, 2013; Moore and Ferguson, 2014) have a common fundamental linkage: both groups lack a clear theoretic

framework for understanding the underlying APD. Although there is disagreement on whether multimodal testing is the course to follow in order to provide *specificity* of the APD diagnosis, the arguments by Dillon et al (2014) and Moore and Ferguson (2013) are not compelling enough to alter the use of modality specificity as the favored theoretic framework to apply in APD assessments. From a neurodevelopmental perspective, Moore and Hunter (2013) favor a supramodal attentional deficit, that they call "neurodevelopmental syndrome," with auditory processing being part of a global set of symptoms or patterns of dysfunction. This is a common position that has been advocated by others (e.g., Musiek et al, 2005). This approach treats poor performance on auditory tests as a symptom, rather than as an indication of a modality-specific disorder of the auditory nervous system. Of course, there is nothing wrong with providing a global (supramodal or polysensory) descriptor, if the *specificity* of the deficit cannot be ascertained. It may well be the case, as Moore and Ferguson (2013) have suggested, that a large portion of children suspected of having an APD may actually have a global attention deficit. However, the possibility that there might be a subset of individuals with modality-specific impairments should be investigated, because lack of diagnostic specificity can result in grouping individuals with heterogeneous deficits into a single/unitary category. Furthermore, diagnostic specificity is important because different deficits may require dissimilar treatments and have diverse prognoses. As we reviewed in our original discussion of modality specificity (McFarland and Cacace, 1995), cases of modality-specific impairment have been identified in the neurology literature through multimodal testing. However, we agree with Moore and Ferguson (2013) that "it is by no means a simple process to disassociate the elements of auditory and visual perception." This is precisely why we advocate that researchers develop tests of perceptual abilities that minimize confounding factors.

Dennis J. McFarland
The Wadsworth Center, NYS Department of Health, Albany, NY

Anthony T. Cacace
Department of Communication Sciences & Disorders, Wayne State University, Detroit, MI

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Comments on "Factors Influencing Tests of Auditory Processing: A Perspective on Current Issues and Relevant Concerns" by Tony Cacace and Dennis McFarland

Cacace and McFarland (2013) have written an interesting and provoking article on auditory processing. Our summary of their main concerns is as follows:

- Auditory processing is defined as a modality-specific activity, and hence an auditory processing disorder cannot be diagnosed unless it can be shown that any deficit in performance is limited to, or at least predominantly affects, just the auditory input modality.
- Auditory processing is a "theoretical construct," "underlying trait," or "disposition" (like personality or intelligence) that cannot directly be observed, rather than a behavior, or a set of test results.
- The characteristics of such an underlying trait can be inferred only by analyzing the results of a set of tests that tap abilities dependent on the underlying trait.