I’m Jim Durkel. I work at Texas School for the Blind and Visually Impaired with their Outreach Program. I was originally trained as an audiologist and a speech-language pathologist and worked with students with deafblindness in a variety of ways for a number of years. I later went back and got my training as a teacher for students with visual impairments.

**Central Auditory Processing Disorder (CAPD)**

Today we want to talk about Central Auditory Processing Disorder or CAPD or APD and its relationship to deafblindness. There’s a lot of controversy about CAPD and its relationship to deafblindness – a lot of controversy about CAPD and is it a type of auditory impairment or not. There has been this controversy for the last 20 years that I’ve been interested in this topic. I think we will continue to see controversy as changes in our ability to do audiological testing, changes in the ways that we think about auditory impairments, evolve over time.

But hopefully today we can answer some questions and help start thinking about what kinds of programming, what are the needs that students with Auditory Processing Disorder have.

**What is CAPD or Central Auditory Processing Disorder?**

I’d like to start with what is CAPD or Central Auditory Processing Disorder? The American Speech Language Hearing Association – is a national organization that works with speech-language pathologists and audiologists as well as other groups, and they came up with a definition of CAPD that I’d like to talk about with you.

They identified six specific types of difficulty using auditory information that seemed to be involved with CAPD.

1. **Auditory localization or lateralization** – knowing where sound is coming from. The first has to do with auditory localization or lateralization. That is knowing where in space sound is coming from. This is a really important auditory skill, especially for our students with visual impairments, because it’s crucial for our students when they’re developing orientation and mobility skills. This is also a very important auditory skill for all of us as learners, because it’s this auditory localization that helps us listen in noise and be able to pick out a specific sound that we’re listening to in the presence of a lot of noise that’s going on around us. So auditory localization/lateralization is one of the kinds of problems that is associated with CAPD.
2. **Auditory discrimination – being able to discriminate speech sounds**
   A second condition is auditory discrimination. Now usually we think about this in terms of speech sounds – being able to tell “pat” from “sat.” Hearing the difference between the “p” and the “s” in those two words involves the ability to discriminate. But here’s also other kinds of discrimination not related to speech – being able to tell the telephone ring from a knock at the door, for example, would be another example of auditory discrimination.

3. **Pattern recognition**
   A third type of auditory skill associated with auditory processing is pattern recognition. And you can think of this when you’re thinking about music and songs and the melody – and being able to recognize a melody. So it took me many, many years before I realized that the melody for “Twinkle, Twinkle Little Star” was used in a lot of other songs, because I don’t have very great auditory pattern recognition. But that you can hear that same melody – that same pattern – across different auditory events. This kind of pattern recognition becomes very important later for the developing of speech and language. It also becomes very important later on, when we’re talking about developing reading. It’s a real important precursor to reading skills.

4. **Temporal aspects of audition – hearing and using sound changes over time**
   A fourth skill associated with auditory processing is what is called in the professional jargon temporal aspects of audition. And what that means is how sound changes over time and how we are able to hear those changes and use those changes to give us some meaning. So, it’s the timing aspect of the auditory information that’s coming in.

5. **Auditory decrements with competing acoustics signals – listening in noise**
   Auditory decrements with competing acoustics signals is this listening to noise that I talked about earlier – being able to hear well in noise. Now all of us have trouble hearing in noise. It’s hard to listen in noise. People with CAPD though have even much more difficulty hearing and understanding in noise than those of us with more intact, normal auditory systems do. So this listening to noise really is an important part of auditory processing.

6. **Auditory performance decrements with degraded acoustic signals signals – listening to muffled sounds; missing information**
   There’s also this idea of listening to sound that’s somehow is what’s called degraded – that it’s not quite as rich or full as we would like it. There are a number of examples of this. One would be, say you’re in the living room, and somebody is in the kitchen, and there’s a wall between you, and you’re carrying on a conversation. So the wall is absorbing some of the sound energy that’s coming through. That signal would be degraded. Now for those who have typical auditory systems, you’re still able to figure out what the person’s saying. For people with Auditory Processing Disorder though, it becomes very, very difficult for them to make sense of the conversation, because there are missing pieces, and their auditory system is not able to fill in those missing pieces as easily as someone who has an intact auditory system can.
Another example of this would be in a classroom situation – typical classroom situation – this happens all the time whenever a teacher is talking and then turns around to write something on the blackboard and keeps talking. So that now they’re not talking to the students, they’re talking to the blackboard. And the students are getting the full auditory signals that they really need to understand what’s going on. So these are the six areas that ASHA has identified as being involved with Auditory Processing Disorder.

7. Hypersensitivity to sound – the inability to tolerate loud sounds

There’s a seventh that many people are starting to talk about now, and it’s this idea of hypersensitive to sound or the inability to tolerate loud sounds. Children who have this kind of hypersensitivity often will be putting their hands over their ears, will cry, will scream, will run away from loud sounds, because it seems like the loud sound is causing them some kind of distress or some kind of pain.

How is Central Auditory Processing Disorder Different from Other Kinds of Auditory Impairments?

So, how is Central Auditory Processing Disorder different from other kinds of auditory impairments? Well, one of the main differences is where in the auditory system the problem is. So if you look at the ear, or actually the whole auditory system, because we’re not just looking at the ear – the ear that we can see. We’re not just looking at the external ear, the auditory canal, the middle ear, or the cochlea; we’re also looking at the auditory nerve going up to the brainstem and up to the cortex of the brain. What we’re really talking about with Auditory Processing Disorder is a problem somewhere above the cochlea. So some problem either in the auditory nerve as it enters the brainstem and/or as all those nerves go up to the cortex – mainly in the temporal lobe of the brain. So in traditional auditory impairments, usually we’re looking at conductive-type impairments where there’s something wrong with the external ear or the middle ear, or we’re looking at a sensorineural-type hearing impairment where there’s been damage to the cochlea. Auditory Processing Disorder we’re looking above the level of the cochlea.

Now another key way that Central Auditory Processing Disorder is different from other types of auditory impairments is that threshold, or sensitivity to sound, is not affected – in that it’s usually within a normal range, maybe just a mild range. You’ll remember from the audiogram that we measure hearing at the different frequencies and by how loud a sound has to be at that frequency before somebody can just detect it, before they can say “Yes I hear that; it’s there.” And that’s called threshold. With CAPD, threshold is not typically affected. So thresholds for pure tones are within a normal, or maybe just a mild, range.

Now in other types of auditory impairments, those thresholds tend to be affected – the sensitivity is lower, sounds have to be louder before an individual is able to say that a sound is just there. This is one of the things that’s very, very confusing for parents and for people who have auditory processing disorders themselves, because they know they hear, and they respond to sounds in the environment, and they respond – they can respond to sounds in the environment that are fairly quiet – that don’t have a lot of
intensity to them. And yet when it comes time to use for them to use those sounds in some kind of meaningful way, they have more difficulty than other people do. So it can be very confusing in that way, and it’s one of the reasons, I think, why there’s a lot of controversy about whether CAPD is a type of auditory impairment or not, because traditionally we thought of auditory impairments as windows – thresholds were affected – that things had to be louder before you could tell that they were there. And that’s not the case here; this is a real difference here for us.

The issue then isn’t that sound has to be louder – the issue is the type of sound that we’re asking the individual to do something with and the kind of environment that we’re asking them to listen in. So you can see a pure tone, if you remember from the earlier units on auditory information in SPARKLE, that sound is a result of vibration. And that often in a pure tone vibration’s very regular; it moves in a very smooth, kind of curved pattern – it repeats very regularly – that in a pure tone the sound is at one frequency. It’s not multiple frequencies; it’s a single frequency and a single intensity.

But speech isn’t that way, and speech is a very complex sound. It’s the most complex sound that we listen to, so we can take it as an extreme. In speech, there are a variety of frequencies and intensities being involved all at once. Again, if you remember from looking at that audiogram earlier, that speech banana where the speech sounds were distributed across the audiogram from low frequencies to high frequencies; some speech sounds were low; some were high, and it spanned a whole intensity range. That when I speak, I am using – I’m creating a lot of different frequencies and loudness, and my speech changes very rapidly. I move from one frequency to the other very, very quickly.

So speech becomes very complex. Just being able to detect say yes I’m talking, no I’m not talking is an easier kind of auditory skill. Being able to take all of that information about the changes in frequency, the changes in intensity, and the timing and being able to take that and process that is what auditory processing is all about. And then, when I start to put additional demands on the speech, so that you not only have to be able to interpret and discriminate my speech, but you have to take meaning out of it. That puts even more demand on a lot of those higher cortical processing functions that the brain has.

So you can see how it can be confusing, because the student may respond to pure tones just fine, but be having a lot of difficulty with speech. And it’s not because they’re faking or that there’s some hidden agenda going on, it’s that the ear can take the pure tone; it can deal with the pure tone but can’t deal with the more complex sound that is in speech.

**How is CAPD Diagnosed?**

So how is CAPD diagnosed? Here’s the bad news for students with multiple impairments. *Most of the tests that are used by audiologists today to diagnose CAPD are speech-language based.* So if you have an individual who is not using speech and language at at least a 3-year-old or higher level, assessment of CAPD becomes more difficult. Now a lot of the CAPD tests were originally designed to be used with adults who had very specific head injuries, and we started using them with children. We are changing; the technology is changing. We’re starting to develop some other tests. And I
think we’ll see those used more and more in the future, but right now the strongest tests that we have are ones that are based on speech and language.

But something very exciting has been happening in the field of audiology over the last 20 years, as desktop computers have gotten smaller and more powerful, we’re able to do some different kinds of testing that have relevance to CAPD. These two kinds of tests are the Brainstem Evoked Response or BSER or ABR – Auditory Brainstem Response testing, and the Otoacoustic Emission Audiometry or OEA.

And these tests are very specific tests of physiological functioning; they’re telling us how the ear is working without there having to be a person connected to the ear really. You don’t want the individual to be participating in the testing the same way that you do, say, during pure tone audiometry where you ask them to raise their hand or drop a block or look to the one side of the room or the other when they hear a sound. What you want is the person to be very quiet, very calm, not move, because you’re testing electrical responses of the ear.

In the OEA, what we’re doing is putting a sound into the ear. That sound is simulating the cochlea, and the cochlea creates a sound that comes back out through the ear, and we’re able to measure it. And that tells us whether or not the cochlea is doing its job. This is a really new test, and I’m really excited about this, because it’s giving us a piece of information that we didn’t have before.

In brainstem testing, we put sound into the ear, and we have electrodes connected to the individual’s head, and what we’re doing is measuring electrical activity that is being generated by the brain in response to the auditory information that’s coming in. Now these two pieces of information alone are being used quite a bit in newborn screening, so they’re becoming very, very common across the country in hospitals when newborns are born, we’re trying to do universal screening, and we’re using these two procedures to look at hearing in very young children and infants.

So these procedures are more and more available to the general population in the country. What this can tell me is if I have a sound – if I have an Otoacoustic Emission Audiometry Response that shows a normal cochlea, but I have an abnormal ABR, or Auditory Brainstem Response – what that’s telling me is that sound is getting in through the outer ear, through the middle ear, to the cochlea. The cochlea’s working okay. But somewhere above the cochlea – in that auditory nerve, in the brainstem, in the cortex – something is happening to that signal, and that it’s not generating the kind of electrical activity that we really want.

So I have a normal cochlea, but I have an abnormal response, so it’s telling me, I think, in my opinion, that I would want to be watching this child and looking for some behavioral indicators of CAPD or Central Auditory Processing Disorder.

- I’d be wanting to look for difficulty localizing sound or in knowing where sound is coming from in space.
- I’d want to be looking for difficulty listening in noise.
• I’d be wanting to look for difficulties with auditory pattern recognition.

I’d be wanting to look for these sorts of things behaviorally to help support what I’m seeing from these physiological tests.

**Auditory Neuropathy**

So now that we’re able to test the function of the cochlea separate from the whole higher auditory brainstem functioning, we’re starting to find a new kind of auditory impairment that I think is just a type of Auditory Processing Disorder called auditory neuropathy. In auditory neuropathy, students have intact cochleas, so there’s no damage to the hair cells in the cochlea, but there’s some problem in the auditory nerve or higher, and these students have normal otoacoustic emission audiometry, abnormal brainstem responses.

In about 50% of these students, they will go on to develop speech and language normally; about 50% of them won’t. We don’t know yet who’s going to go on and who’s not going to go on. At this time, that’s unknown. Because, especially the otoacoustic emission testing is so new, we really don’t know a whole lot about these students.

*The one thing that we do know is that if you have a normal cochlea, you don’t want to use a hearing aid.* So now I’m thinking in the past about students that I saw that I thought had profound sensorineural hearing impairments. I thought the cochlea was damaged, so I put hearing aids on them, and they were constantly pulling the hearing aids off; they would not wear the hearing aids. Now, I’m wondering if those students really had auditory neuropathy. The cochlea was normal; the hearing aid was making the sound louder, and that was really creating pain. And that’s why the student was taking the hearing aid off, but because of the problems with the auditory nerve were higher, these people weren’t able to go on and develop speech in a typical sort of manner. So they may have looked like they had profound deafness as a result of cochlear damage, but they really didn’t.

So auditory neuropathy is a new type of impairment that we’re looking at, and I think we’ll see more and more information coming out, and then we’ll start to develop better and better techniques for dealing with these students. I do see auditory neuropathy, as this point in time, as sort of a sub-group or a separate type of Central Auditory Processing Disorder.

**What Causes CAPD?**

So what causes CAPD? *Well, anytime there is some kind of damage to the neurological system, particularly the auditory neurological system, I think we have a situation where there could be CAPD.* There are a variety of fairly common causes, and many of them are the same sorts of things that caused traditional auditory impairments.

• So we know that premature birth – students who are . . . children who are born early often have immature neurological systems. Some of those children will go on to develop; some of them won’t. At this point in time, we don’t always know who’s going to go which way.
- **Anoxia** – *so lack of oxygen at birth* can damage . . . can cause neurological damage.

- There’s a really interesting condition . . . interesting for me, because one of the first students with deafblindness that I ever worked with had this condition, and that’s *hyperbilirubinemia, or the child that’s born jaundice*. So they’ve got these high levels of bilirubin in their blood, and usually the intervention is you put the child under ultraviolet lights, so that it helps break up the bilirubin, and the jaundice goes away.

What the person that I worked with had a visual impairment and had a hearing impairment and actually had impacted auditory thresholds, so he looked he had a severe hearing loss when we first started serving him in our infant parent program. As he spent time through the infant parent program through the preschool program, his hearing thresholds got better and better and better until the point at which he was dismissed from our program at kindergarten, he basically had normal hearing thresholds.

As I started talking with some other audiologists who saw some similar things happening with children they were working with, we started hearing about how high bilirubin can affect myelinization of the auditory system. Myelin is this substance that develops around the auditory nerve; it comes around the neurons, and it helps those neurons conduct energy more efficiently. See, you can think of it as . . . if you take a garden hose, and you stab a bunch of holes in it, and you turn the water on. Water’s going to come out of the holes that you stabbed as well as out of the end. It’s not a very efficient way to get water from the tap to the end of the hose, but if you take tape, and you wrap it around that hose and plug up all those holes, then the water can go more efficiently through that hose, and come out the other end.

What it looks like is the bilirubin affects that myelinization, and it keeps that tape from going around that hose – from around that neuron. The neuron doesn’t work as well; information doesn’t get through that neuron as efficiently as it should be. Now if you can decrease the bilirubin early enough, and possibly if you give the right kind of auditory environment that encourages the development of the auditory system, then you may be able to overcome the effects of the high bilirubin levels, and that was true with this student that I worked with. I don’t think it’s true of all students. Again, we don’t know which way the student is going to go. But we’re seeing more and more attention being paid to these high bilirubin levels and this kind of auditory impairment.

- **Certainly any kind of disorders that cause damage to the brain and brain tissue, the brainstem can result in auditory processing disorders.** So things like meningitis and encephalitis, whether it’s direct infection, either around the
menges that covers the brain or the encephalitis . . . the brain itself put the child at risk.

- Or any kind of trauma, so head blows, any kind of car accident, closed head injuries, open head injuries, can cause damage to the neurological system, particularly the brain and the brainstem, and can result in this kind of problem.

- In children with Central Auditory Processing Disorder alone, it looks like sometimes this condition runs in families, so there may be a genetic component where one or more of the parents or someone else in the family seems to have this difficulty as well. So, we’re looking at possibly some kind of genetic component as a cause for Auditory Processing Disorder.

- Now the last category is one that’s a little controversial. And some people who think that it is a cause, and some people who think that it’s not, and that is chronic otitis media or chronic middle ear infections with fluid build-up behind the eardrum.

What research seems to say is that students who have Auditory Processing Disorder only have a higher history of having had chronic otitis media as younger children. So there seems to be some relationship that’s going on there. The theory is that when you have that fluid build-up behind the middle ear, the middle ear is not working as efficiently as it should – that eardrum’s not vibrating, those ossicles aren’t vibrating – you’re not getting sound back to the cochlea as efficiently as you should. And if that is happening during what’s called a critical period, so when the auditory system is developing, and it needs auditory input to develop normally, and because of the otitis, it doesn’t get that input, then this system may not develop like it should.

Again this is controversial, but I think it’s something that bears looking at – that if you have a child that has this chronic, repeated otitis, where there’s fluid behind the eardrum, and that there’s enough fluid there that hearing thresholds are decreased, and it’s happening before the age of 3 on a regular basis, I’d want to watch that child. I’d want to consider that child at risk for Auditory Processing Disorder, because we don’t really know definitively that that’s not going to cause some problems later on. And there does seem to be some indications that it does have an impact on the development of speech and language and auditory processing. Now, just to let you know, I was a child like that; I think I turned out okay, but it’s something to watch.

**What are Some Ways that We Treat CAPD?**
So, what are some ways that we treat CAPD? What are some things that we can do to help a child with CAPD use auditory information more efficiently and in a better way?

- One of the first things that we really need to look at is the signal, what we’re asking the child to listen to, and the environment – the listening situation that
we’re asking the child to listen to. These are easy things to look at, and they’re safe things to look at, because they benefit all children. *So, we always want to make sure that our signal is as clear as possible.* We don’t want to talk to children from other rooms. We don’t want to talk to children from far away; we want to be as close as we possibly can, so the child really is getting good auditory information – that the signal isn’t degraded, it’s not muffled, it’s not being . . . having to go through walls or it’s not coming from behind our backs.

- We want the listening environment to be quiet; we don’t want noise. These are children who often have difficulty listening in noise. These are . . . I didn’t mention this earlier . . . it’s not just noise, but it’s also this idea of echo and reverberation that are very hard listening situations. So one of the worst things you can do to a child with Central Auditory Processing Disorder is ask them to listen to something that’s very important when they’re in a school cafeteria or a school gymnasium during a basketball game. That would be a horrible listening environment for that child, because the gymnasium or the cafeteria are so noisy, and it’s fully of all these hard surface, and there’s lots of echoes going on, then it becomes very, very difficult for someone with an impaired auditory system to listen in those kinds of situations.

Another kind of listening situation that’s not really good for a person with an Auditory Processing Disorder is trying to carry on a conversation in a car. Cars are very noisy. Oftentimes parents are in the front seat; the child’s in the backseat. Remember your face isn’t facing the child’s face; they’re getting a degraded auditory signal, plus there’s all the noise going on, plus there may be a lot of other sensory stimulation going on that can be interfering with the child’s ability to attend to and listen to the sound.

There is one student that I worked with a long time ago. And it was just almost totally by happenstance that we figured out . . . this was a child who had significant multiple impairments. If that child was in a lit room, he appeared to be profoundly deaf; he did not use auditory information. If we took away visual information from that child – we put him in a dark room, he was able to use auditory information and actually tested as a normal hearing child.

What do I think was going on . . . and this is think going on, because I certainly don’t know definitively . . . but in the brainstem, there is a place where auditory information, visual information, information from all the senses actually comes through this reticular activating mechanism – this part of the brainstem. And one of the things that we were supposing was there was some problem in this part of the brain for this child. So that when there was multiple sensory information, the brain would shut down some of the sensory channels and would only pay attention to one channel. And it looked like for this child, vision sort of was the winner – that if there was light, if there was visual information coming in, that was the sense that got attended to – that was the sense that made it through this part of the brain and on up. Where if we took away the vision, then other kinds of
sensory information, specifically auditory information, was able to get in, and the child was able to use it.

So sometimes it’s really a matter of looking at the environment, looking at the signal, making sure that we are talking clearly with our child in a good listening environment where’s there’s not a lot of competing auditory information or a lot of competing other kinds of sensory information.

- We want to look at this signal; we don’t want to use . . . remember this is an individual who has difficulty using speech, so we don’t want to use long phrases; we don’t want to use long utterance, we want to use shorter phrases – things that are more concretely related to the here and now to help the child make sense of what they’re hearing. So creating a good listening environment and really doing some good thinking about how we’re talking – the kind of signal that we’re giving the child to listen to really is quite important.

- In children with CAPD alone, we also teach the use of coping strategies. So we teach that child to recognize that they don’t always . . . they can’t always rely on what they’re hearing . . . that they do have to use other sensory information to back it up. So we teach the child to do things like use their vision to confirm what they might have heard.

We teach coping strategies like get closer to the speaker, ask the speaker to repeat, paraphrase what you thought you heard the speaker say, and see if the speaker confirms that, indeed, that’s what they said. Now, as the speaker, if I’m working with a child that I know has CAPD, what I will do is go back and ask questions to confirm that the child heard what I said. So I might ask the child, “So, tell me that in your own words. What did you just hear me say?” So I’d want to check for comprehension.

But we do teach these coping strategies; often these coping strategies are related to using other kinds of sensory information. We’re going to come back to that, because that may be a problem in a child that has a visual impairment.

- I think that we could also look at the use of auditory stimulation, for lack of a better term, or auditory training, as an intervention – helping the child learn, systematically learn, to use auditory information.

Now, there’s a real danger when we work with children with any kind of auditory impairment. And that is that, if it appears they’re not using auditory information, oftentimes it’s very easy for us to stop providing auditory information. So one thing that we do with our students that have auditory impairments is often we come more and more quiet. Because we’re thinking the child’s not using the auditory information, we stop providing it. Or we’re not getting feedback, so the child’s not using their voice and their speech to us; we’re not getting feedback.
that auditory information is meaningful to a child, so we start to provide less and less. We don’t want to do that.

Again, we have to be careful; we don’t want to provide a lot of noise; we don’t want to do stimulation under this idea of bombardment where we’re just throwing lots of random sound at the child; we don’t want to do that. *But we do want to make sure that there’s a rich listening environment – that we’re providing opportunities for the student to hear things.*

*We want to make sure that what the student is hearing is meaningful – it’s connected to something concrete and real.* So, I don’t want to just play the tape of different kinds of environmental sounds to these children; that’s not going to be helpful. But certainly, when I’m out in the environment . . . when I’m out in the Wal-Mart parking lot, and a car honks its horn, I want us to go look at that car and go, “Hey, did you hear that? That came from this car. That car was honking.” Or if we’re taking a walk around the neighborhood, and a dog barks, we want to go over . . . we want to connect. Where’s that sound coming from? What’s creating that sound? – in a meaningful sort of way.

*Now I also think it’s important that we provide opportunities for the child to engage in play with sound,* so that we provide sound-making toys whenever we can. Even if have a child who’s using switches to activate toys, we want to make sure that those toys do produce sound – that the child has the experience of being able to produce a sound – that they can recognize that their action on the environment produces sound.

*We want to encourage the use of voice whenever we can,* but not all children can use their voices. *But when we can, we want to encourage even things like laughing, making funny noises.* One of my favorite things to do in grocery stores is teach babies how to blow raspberries while their parents aren’t looking. I think it’s a lot of fun for me; I get a lot of nice interaction with the child. It’s enjoyable. *And it’s important that our auditory training, our auditory stimulation, be meaningful to the child but also be enjoyable for the child.*

And I think it’s okay for us to do things like give music to children with auditory impairments. And sometimes we think, “Oh, they can’t hear. They don’t use auditory information.” And so we don’t give records or tapes or CDs to these children as birthday presents or Christmas presents, and I think it’s okay that we do that; I think it’s okay that we give that kind of opportunity for play and for enjoyment using the auditory sense to our children with auditory impairments.

So that’s the sense that I mean auditory training, auditory stimulation – that we think about the kinds of information that we’re giving, and we give it in a way that’s meaningful and enjoyable to the child.
Medical Intervention
I also just want to talk a little bit about medical intervention, and particularly when we’re talking about chronic otitis media, one of the most important treatments that we have is medical intervention.

- The use of antibiotics to treat the infection.
- The use of PE tubes through the eardrum to help relieve the pressure changes, so that the fluid can drain more normally, and so there’s less likelihood that there be reoccurring chronic otitis problems.

Medical treatment can be very important when you’re thinking about CAPD. When we’re thinking about hypersensitivity to sound – children that react abnormally to sound loudnesses – there are also some medical conditions that I think we need to think about. Certainly hypersensitivity to sound in people without other disabilities is highly associated with migraines. It’s very possible that our children with significant disabilities may have migraine headaches, and as part of that, are having abnormal reactions to sound.

Now one of the other things that I’d look at – other abnormal reactions to other kinds of sensory input, because people with migraines not only have difficulty with sound but also with light, sometimes even with touch, so that these are people who often have to go to a dark, quiet room until the headache passes, so that they’re able to get over the headache and move on.

There are some kinds of seizure disorders that are associated with hypersensitivity to sound, particularly temporal lobe seizure disorders. Remember the temporal lobe is where information – auditory information – gets processed in the brain.

So there may be some medical conditions that we need to check out and rule out before looking at some of these other intervention, because we wouldn’t want to miss the opportunity to use a medical intervention to treat something and get rid of it – you certainly don’t want to lose that option.

And finally, in terms of hypersensitivity to sound, sometimes we may need to do some systematic desensitization to the sound just like we would do behavioral training – desensitizing the child to other kinds of sensory input – we may need to do that for hypersensitivity to sound as well. So those are some of the interventions that we can look at with CAPD or Auditory Processing Disorder.

How Might CAPD Interact with a Visual Impairment
So how might CAPD interact with a visual impairment? Would I consider a child with CAPD and a visual impairment to be deafblind? Me personally, yes, I definitely would consider it, and here’s some reasons why.
I think for our students with visual impairments, we’re asking them to do things with their auditory systems that are different than we ask people who are sighted to do with their auditory systems. Number one, for a person with a visual impairment, the auditory system may become the primary distance, or the only distance, sense that person has. Now, as a sighted-hearing person, I’ve got two useful senses – I’ve got hearing and vision. My vision’s gone; all I’ve got is hearing to back me up, so putting more demand on the auditory system to serve as my distance sense.

*Students with visual impairments are often asked to use their auditory sense as a primary learning channel,* so we really encourage them to listen and to get information and to use that auditory information in the absence of visual information to create their concepts or their knowledge of the world. And this is a lot harder.

*Auditory information isn’t as concrete as visual information.* You don’t get the same connection of pieces to whole that, if using auditory information, that you get with visual information. So it puts more of a demand on that auditory system, and we’re asking the child to do that.

There are a lot of technologies right now that ask the person with the visual impairment to use their auditory sense to compensate. For example, there are programs that will read what’s on a computer screen – will give you auditory output of what’s on that computer screen. Most of us as sighted individuals don’t do that. We don’t use that auditory information; we use our visual information to tell what’s on a computer screen. And, oftentimes, the kinds of voices that those screen readers use, or there are note takers that also . . . I can keyboard in something and get it back auditorily. The information that I get back, the voices that are used, to me are very degraded auditory signals. They’re very difficult to listen to, because they’re synthesized speech, so they’re sort of robotic; they’re not real easy to listen to. I think for a person with an auditory processing disorder can be even more difficult.

*We also ask the person with a visual impairment to use auditory information for orientation and mobility – for travel, for safety reasons.* And this idea of localization – this is where localization becomes so important. If I am a person with a visual impairment, and I’m trying to cross a street safely, I have to be listening for traffic, and I have to know what direction is traffic coming. Is it coming across one direction, or the other? Is it coming from in front and going back? Is it coming from my back and going in front? So that I know when it’s safe for me to cross with traffic or when it’s not safe, because I’d be crossing against traffic. And this is a very, very important auditory skill for safe, independent travel for a person with a visual impairment.

This kind of localization/lateralization is very difficult, if not impossible, for a person with Auditory Processing Disorder. So because I ask, because we ask, the person with a visual impairment to use their auditory systems in different ways and put more demands on that auditory system. And if there’s an auditory processing disorder, I know I’ve got an auditory system that doesn’t really tolerate more demands; it’s already sensitive to demands.
That’s one of the main reasons that I would consider a person with a visual impairment and an auditory processing disorder as being deafblind, because I would say there is a unique combination of the visual impairment along with the type of impairment in using auditory information that the Central Auditory Processing Disorder has created that makes education, independent living, safety harder for that person with a visual impairment and CAPD. And I would say it’s that unique combination really fits in with that federal definition of deafblindness.

By recognizing these unique combination of needs – the unique needs of the sensory system – the visual loss and the Central Auditory Processing Disorder, I think we really can start to develop good programming for these students and have a real positive impact on their educational program and their future lives.