

Learning Disabilities in Higher Education:

Musical Timing Deficits and Remediation Strategies

Dr. Sara Raviotta

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Hello. Welcome to “Learning Disabilities in Higher Education: Musical Timing Deficits and Remediation Strategies.”

I’m Sara Raviotta. I’m principal flutist with the San Angelo Symphony and a freelance musician and consultant in the Dallas/ Ft. Worth area. I have an active private flute studio and work extensively with students with learning disabilities. As part of my doctoral research, I wrote the first self-help manual for musicians with dyslexia and attention-deficit/hyperactivity disorder, or ADHD. I believe that with a little bit of knowledge, hard work, support, and some positive coping strategies, high functioning students with learning disabilities can learn to navigate the field of music and achieve independent success throughout their musical studies and beyond.

As we know, music students enter their higher education core music classes with differing skill sets, background knowledge, self-developed coping strategies, and preferred modes of learning, such as visual, audio, read-write, or kinesthetic modes of learning. I’ve added a link in my learning module if you’d like to know more about the different modes of learning. Music students with learning disabilities could have added challenges in the classroom, such as organization of their time, thoughts, and materials; focused attention; spatial and directional awareness; retention of new concepts; the ability to process written and oral information quickly and accurately; note reading; memorization; and sight-reading. But one of the most important aspects of music and one that can tend to cause a lot of problems is musical timing: which is, time, pulse, and rhythm. I’ll discuss what some of the common learning disabilities are and why we want to be aware them, how those disabilities can affect musical timing, what to look out for in the classroom, and some ideas for accommodation and remediation of musical timing deficits.

Neurodevelopmental disorders are a group of conditions that affect brain function, causing excess or deficits in academic, social, personal, and occupational development and performance. Neurodevelopmental disorders include specific learning disorders like dyslexia, ADHD, autism spectrum disorder, and other developmental, social and motor coordination disorders, such as stuttering and tic disorders. Neurodevelopmental disorders, particularly specific learning disorder, ADHD, and autism spectrum disorder range in severity from mild to moderate to severe, and even profound or pervasive. For more specific information about neurodevelopmental disorders, feel free to click on the link in my learning module.

There's also a high rate of co-occurrence between the neurodevelopmental disorders, meaning that the symptoms for one or more of the conditions will co-exist and overlap. I invite you to click the link below for a graphic on the co-occurrence of ADHD and specific learning disorders, where you'll see that eighty-five percent of people diagnosed with ADHD will also have a mild specific learning disorder. Studies have reported thirty-seven to eighty-five percent co-occurrence rates between autism spectrum disorder and ADHD. I've also added another link to a Venn diagram showing the symptoms of dyslexia, ADHD, and their overlapping symptoms, such as problems with listening and understanding, handwriting, self-esteem, anxiety, inattention, motor coordination and organization, among others. Because of these overlapping symptoms and imperfect testing, people can have a diagnosis of one condition and another undiagnosed condition.

So, why is it important that we talk about neurodevelopmental disorders, in the classroom? Why should we care? The numbers of diagnosed cases of neurodevelopmental disorders are staggering. The International Dyslexia Association reported that twenty percent of the general population are diagnosed with symptoms of dyslexia. Therefore, according to statistics, a minimum of twenty percent of musicians will have dyslexia, although in reality, numbers might be closer to fifty percent, due to dyslexic right-brain advantages and a propensity to succeed in artistic fields. For further research into the fifty percent number, check out the article, "Thirty-Seven Oboists" by British biochemist and oboe teacher Carolyn King. The Center for Disease Control reported ADHD numbers higher than thirteen percent in some states. They also reported that one in forty-four children, or about two and a quarter percent have been identified with autism spectrum disorder. These statistics only cover those with a formal diagnosis, not the undiagnosed. Therefore, it is likely that music teachers WILL encounter students with neurodevelopmental disorders every single semester. When I first learned these statistics, I realized that without an awareness of dyslexia, I could only reach eighty percent of my students, even if I was one-hundred percent effective as a teacher.

My husband, Benjamin Raviotta, is a professional horn player and university professor. He was diagnosed with ADHD at fourteen and dyslexia through electroencephalogram, or EEG, and diagnostic testing at the late age of thirty-three while working on his doctoral dissertation. He's going to share an excerpt from his personal story from his dissertation about his struggles in music without a dyslexia diagnosis. He was never tested for dyslexia as a public-school student because his intelligence and coping mechanisms helped him to get good grades:

(Benjamin) Hello. It's good to be here. Since the discovery of my comorbid ADHD and dyslexia, I have researched and incorporated as many remediation techniques into my own life as possible... Initially, I was sad and angry that I 'fell through the cracks' in the public school system. My life would have been so much easier with an earlier diagnosis, remediation, and accommodations. I wonder what daily successes, prestige, and opportunities I missed because of a late diagnosis. But, I also realize that testing is imperfect, and new research has dramatically changed our knowledge of ADHD and dyslexia. I also know that things could have been much worse... If not for my dyslexia, it is also possible that I may not have developed heightened musical instincts, good pitch recognition, and strong intonation. My life is not any

easier, but my life story as a whole makes much more sense. I understand my strengths and weaknesses and how to overcome them. I am excited to help others like me...”

(Sara) Musical timing, or time, pulse, and rhythm, involves many parts of the brain, making accuracy a feat for neurotypical students, let alone those with neurodevelopmental disorders. A steady pulse is how we mark or show time. Rhythms are mathematical patterns that can only exist within the confines of a pulse, or between two markers of time measured in beats per minute. Students with neurodevelopmental disorders can struggle with musical timing due to deficits in the many areas of the brain that are activated while listening to or performing musical timing tasks.

Accurate rhythm processing while reading sheet music, involves visual processing or decoding skills in the occipital regions of the brain. Perception of time and pulse and execution of rhythm while conducting, composing, or playing an instrument involves motor coordination and timing skills from the motor and auditory cortexes and rapid temporal processing from the temporal lobes. Working memory, like the random-access memory of a computer, helps to temporarily store and process rhythm in preparation for performance, activated by the prefrontal areas of the brain.

Rhythm execution, or performance, involves two processes: accurate motor timing skills and rapid temporal processing. Motor timing difficulties affect areas of balance and handwriting, and make it difficult to count out loud, clap, and tap a foot at the same time or to play fast, articulated runs on a wind instrument. The “rapid temporal processing” theory suggests a difficulty in the ability to process quick, repeated notes. Students with neurodevelopmental disorders may find it difficult to perform with a steady metronome pulse or to accurately subdivide rhythms, despite being able to hear the beat. Or, a student who can hear the difference between a dotted eighth- sixteenth note pattern and a pattern of two eighths when performed by a teacher, might lack the muscle control necessary to make a clear distinction between the two rhythms when asked to perform them on his or her own. Other timing deficits involve time estimation, or the ability to anticipate the beat and prepare to act, visual motion detection, and the ability to translate thoughts into actions.

Katie Overy, music psychologist and Lecturer in Music at the University of Edinburgh, conducted musical timing tests with children with dyslexia and found significant difficulties with tasks involving rapid auditory skills, especially in tests of note number detection, where children with dyslexia tended to overestimate the number of notes heard. The dyslexic group also had trouble keeping a steady pulse when performing and copying rhythm at a tempo outside of eighty beats per minute. The results of this test could explain why some students with neurodevelopmental disorders find it difficult to maintain a steady foot-tap to the metronome, especially when tempos are faster than EIGHTY beats per minute. Feel free to reference my resources page for all relevant research.

Problems with musical timing can have profound effects on performance in college music classrooms, particularly in core music classes like ear training or aural skills, conducting, and

class piano. There are a few subtle signs that professors can watch out for. Students with neurodevelopmental disorders tend to become masters at the art of mimicry, rather than masters of rhythm and pulse. They can closely approximate rhythm or repeat directly after the teacher but have a hard time re-creating the rhythm or tapping their foot to the beat on their own. They might tap their foot to the rhythm rather than the pulse. Their eyes might wander or stare through a page of music rather than track a line of music from left to right. During melodic dictation, they might get so distracted with figuring out the rhythm that they miss the pitches entirely. Or their handwriting is so tiny and messy that they can't figure out what they wrote. They might have trouble subdividing to the point where dotted eighth rhythms sound like triplets and they can't hear the difference. Maybe there are signs of anxiety, headaches, eye-rubbing, fidgeting, getting up to throw things away, or inappropriate outbursts of emotion.

Benjamin Raviotta is here to read another excerpt detailing some of his personal ADHD and dyslexic struggles in his university upper-level piano and ear training classes:

(Benjamin) In Piano Three and Four, I performed standard Alberti bass lines, chord progressions, and figured bass with the left hand while playing right hand melodies. I found it easier to memorize the notes and progressions so that I could look at the keys while playing. However, my instructor insisted that I keep my eyes on the music. When I took my eyes off the keys to focus on the notation, I struggled to coordinate my left and right hands simultaneously. When I finally practiced enough times to pass an assignment, the teacher then asked me to add foot pedals in the appropriate places. Unfortunately, I never quite mastered the coordination needed to play with all four limbs. My empathetic teacher modified my assignments by omitting the foot pedals, thus allowing me to earn "B's".

Recurring rhythm, pulse, and coordination problems made the rhythm portion of Aural Skills extremely difficult. In all five semesters of the course, we delved into complex rhythms. We received grades for conducting and counting aloud using the standard counting system as well as performance of two-handed rhythms.

I spent hours a day attempting to move my body in time while conducting, counting, or tapping. I attempted to remediate my poor pulse and rhythm through intense practice. However, looking back, I realize that I learned to mimic and approximate the other students' skills instead of fully and independently internalizing the rhythms. This mimicry meant that while I approximated correct rhythms, I never played exact rhythms, most notably in the dotted-eighth-sixteenth figure. Even though these skills were difficult, they were achievable. I improved over time and passed off all the required assignments.

When it came to melodic dictation, the expectation was to identify and notate the pitch and rhythm of a melody in two hearings. We were given approximately two minutes to dictate the melody. If the rhythm was simple, for example, quarter and eighths, the tempo slow, and the example short, I was able to successfully complete the dictation. As a horn player, I was excellent at identifying intervals and pitches. However, when the rhythm or meter was more complex, the tempo faster, or the example long, it was too much information for me to process. During a test, my first step was to scratch out the rhythm upon the first hearing. I found it too distracting to dictate while listening, so I attempted to memorize the example and dictate the rhythm from my short-term memory. However, poor short-term memory and distractibility

meant that I was only able to dictate rhythms from the last half of the example. When it came time for the second hearing, only half of the rhythm was complete and none of the pitches identified. I went into full panic mode. The anxiety prevented me from doing anything useful with the second hearing.

After failing numerous melodic dictations, I tried reversing my methodology by focusing solely on the pitches during the first hearing. This technique was more successful, as I was able to sketch out the correct pitches after only one hearing. However, because I focused solely on the pitches, I had only one more attempt to get the correct rhythms, which was never enough time. My handwriting was so illegible that half the time I could not read the notes or rhythms I scratched out in my haste to finish quickly. My failures on melodic dictation led me to receive solid “B’s” in all of my aural skills classes and my lack of mastery forced me to need remediation during my graduate studies.

(Sara) Students in higher education must register with their university’s office of disabilities or accessibilities and provide documentation of their conditions to receive help and benefits. According to the Americans with Disability Act of 1990, or ADA, universities that receive federal funding must provide reasonable accommodations and services so students can receive equal access to a quality education. Some professors are concerned that students with disabilities who receive accommodations might be given an unfair advantage to their neurotypical peers. Because of scientific evidence presented on brain scans, professors needn’t worry about that. The accommodations are meant to even the playing field.

The office of accessibilities can help with some of these accommodations: distraction-free testing locations, help with practice by way of setting up assistive technologies, organizing a schedule of practice time, chunking music into manageable parts, and finding resources to help with specific deficits related to specific conditions. They can help print assignments and tests on colored paper for students with visual processing problems, they can read directions out loud with eye contact if needed, they can help a student to draw arrows, pictures, write in counts, or add colored highlighter to scores in order to indicate direction and repeated rhythmic patterns. They can enlarge a score and remove awkward first and second endings or Da Capos in the part.

With the assistance of the office of accessibilities, students can learn to help or advocate for themselves. They can use a vibrating, wearable pulse metronome while practicing or conducting. In front of mirror, students can conduct and sing while feeling a sense of swing in their arms in order to kinesthetically feel which part of the beat they’re on. Or maybe students might visualize numbers or certain colors for parts of the beat or find connections between the rhythm in one example and the rhythm in another. Maybe a certain rhythm evokes an emotion or visual scene from a memory or a movie. Students might consider sending an introductory email to their professors providing some personal information about their conditions, how the symptoms manifest in their work, and accommodations that have worked for them in the past.

Professors might consider altering a few things that will help students with disabilities but also neurotypical students in the classroom, such as providing test papers with a larger, sans serif font, avoiding italics, printing large blank music staves with pre-printed bar lines for dictation

tests, and providing musical examples at EIGHTY beats per minute, as referenced in the Katie Overy research. They might consider using a large pendulum metronome or display a digital metronome so that students can hear and see the beat. They might allow students to use mobile devices for note-taking due to poor handwriting or for taking pictures of the board or recording parts of the lecture. They might omit the requirement of foot pedals for class piano. They could have students practice walking to a beat while clapping and singing rhythms to make learning more multisensory. They could reduce distractions such as ambient sounds, smells, and flickering lights. They might be able to offer a morning and an afternoon section of the course to help accommodate for medication schedules and the student's optimal time of the day for learning.

In regard to melodic dictation, it might be necessary to take a more step-wise approach. Professors could separate and assess the skills of rhythmic dictation and melodic dictation by providing the rhythm above the example. Are there extra assignments posted online that students can use to practice? Maybe professors can offer a non-graded warm up dictation at the beginning of each class where the students can have the opportunity to try and fail without penalty, then assess as a class, and the teacher corrects common problems or explains how they hear the example... this rhythm is just a triplet, or a pineapple. Here's how I hear it, or here is how I'd go about it. Maybe there's a rhythm shorthand you use during the first listening or two.

Additionally, students with disabilities might need extra time on tests, 2 extra hearings on dictation assignments, more silent thinking time between hearings to translate thoughts onto paper, or they might need to have an eight-bar example divided into two separate parts. It would be immensely helpful to have a rhythm bank like a word bank on tests of melodic dictation. Maybe there is a line for rough draft practice scribbling and a line for the final answer with more legible handwriting. Professors might also consider allowing students to use the rhythmic counting system they feel most comfortable with such as the standard counting system of one, e, and a, Eastman or West Texas counting system of one, ti, te, ta, or a word rhythm approach. Feel free to take a look at the word rhythms and pictures that I personally use with students for rhythmic recall in my learning module below.

Music students with neurodevelopmental disorders can overcome musical timing issues and become successful in their core music classes and beyond. I encourage students, their university's office of disabilities or accessibilities, and professors to open up a line of communication. Students often need a little bit of direction and coping strategies and with some hard work and ingenuity, they can come up with their own solutions or ideas for solving problems. They need to know what resources are available to them and they might need a few remediations and accommodations to level the playing field. Good luck everyone!