

Learning Disabilities in Higher Education: Musical Timing Deficits and Remediation Strategies

Dr. Sara Raviotta
sararaviotta@gmail.com

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Abstract: Musical timing, or accurate perception of time and pulse, as well as execution of rhythm, can be troublesome for students with neurodevelopmental disorders due to slow or inaccurate decoding skills, motor timing skills, visual processing, and rapid temporal processing. Timing deficits can affect performance in core music classes, particularly in the vein of ear training, conducting, and class piano. Up to 20% of the population could have one or more learning disabilities, making it statistically likely that professors will encounter students with these conditions each year. Students and educators can begin to recognize signs of timing deficits and apply simple strategies for accommodation and remediation.

Agenda

- Common Learning Disabilities
- Prevalence
- How Learning Disabilities Affect Musical Timing
- Symptoms in the Core Music Classroom
- Accommodation and Remediation

Neurodevelopmental Disorders

- Affect brain function, causing excess or deficits in academic, social, personal, and occupational development
- Include these conditions: specific learning disorder/dyslexia; ADHD; autism spectrum disorder; developmental, social, and motor coordination disorders
- Range in severity: mild, moderate, severe, profound

Neurodevelopmental Disorders: Co-Occurrence

- High rate of co-occurrence: 85% ADHD and dyslexia and 37-85% ADHD and autism spectrum disorder
- Overlapping symptoms
 - ADHD and dyslexic overlap includes problems with listening and understanding, handwriting, self-esteem, anxiety, inattention, motor coordination, and organization
- Diagnosis of one condition + an undiagnosed condition

Prevalence

- International Dyslexia Association: 20% of population has dyslexia
- Center for Disease Control (CDC): up to 13% has ADHD

- CDC: 1 in 44 has autism spectrum disorder
- Statistics of neurodevelopmental disorders in music could be much higher due to creative right-brain advantages and a propensity to succeed in artistic fields

Musical Timing

- Musical timing = time, pulse (consistently marked time in beats per minute), and rhythm (mathematical divisions of time between 2 pulses)
- One of the most important aspects of music
- Can cause problems for students with neurodevelopmental disorders

Musical Timing: The Brain and Rhythm

- Rhythmic notation processing: occipital regions
- Perception of time and pulse and execution of rhythm: motor cortex, auditory cortex, and temporal lobes
- Working memory for storing and processing rhythm: prefrontal areas

Musical Timing: Rhythm Execution

- Rhythm execution = performance of rhythm
- Involves 2 processes:
 1. Motor timing: moving your body in time
 2. Rapid temporal processing: processing sounds or the beat
- Difficulties: performing with metronome or subdividing the beat, despite hearing it; muscle control; anticipating or seeing the beat; complex rhythmic patterns; repeated notes; time estimation; translation of thoughts into action
- 80 beats per minute! 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 in perception and performance at tempos outside of 80 bpm.

Symptoms in the Music Classroom

- Mimicry rather than mastery
- Foot-tapping the rhythm rather than the pulse
- Appearing to read, but not
- Difficulty multitasking, or separating rhythm from pitches
- Poor handwriting
- Trouble subdividing
- Anxiety, inattention, fidgeting, emotional outbursts, etc.

Remediation and Accommodation

- Americans with Disabilities Act (ADA): reasonable accommodations and services so students can receive equal access to a quality education
- Students must register with their university's office of disabilities or accessibilities to receive accommodations and services
- Accommodations even the playing field

Remediation and Accommodation: Office of Disabilities/Accessibilities

- Distraction-free testing environments
- Assistive technologies
- Alter visual content
- Help organize time and materials
- Locate and offer resources for specific deficits related to specific conditions

Remediation and Accommodation: Self-Help

- Ask for help
- Wear a vibrating, pulse metronome
- Practice in front of a mirror
- Use multi-modal practice techniques (e.g., sing and conduct)
- Visualize colors, scenes, emotions... use context

Remediation and Accommodation: Professors

- Test at 80 bpm
- Visual metronome
- Mobile devices
- Reduced ambient distractions
- Multisensory teaching
- Rhythm bank, like a word bank on dictation tests
- Word rhythms
- Morning and afternoon class sessions

Conclusion

- Students with neurodevelopmental disorders can overcome musical timing issues and be successful in their core music classes and beyond.
- Students need:
 - Remediation
 - Positive coping strategies
 - Access to and awareness of resources
 - Possible accommodations
 - Encouragement to find their own solutions

Resources

Dyslexia	
<p>American Dyslexia Association Free printable worksheets, apps, and resources www.american-dyslexia-association.com</p> <p>Dyslexia Daily Free worksheets, videos, blog, and resources www.dyslexiadaily.com</p> <p>Dyspraxia Support Group of New Zealand www.dyspraxia.org.nz</p> <p>The International Dyslexia Association (IDA) An international organization dedicated to the treatment and study of dyslexia www.interdys.org</p>	<p>Irlen Institute (for colored overlays) Services and tools for children and adults with visual processing problems, including those with reading and/or learning difficulties and ADHD www.irlen.com</p> <p>Learning Ally Library of over 80,000 audiobooks for students and adults with reading-related learning disabilities and visual impairments www.learningally.com</p>

ADHD	
<p>ADD Resources Links and resources for ADHD www.addresources.org</p> <p>ADDitude Support for ADHD and LD www.additudemag.com</p> <p>Attention Deficit Disorder Association (ADDA) www.add.org</p> <p>Attention Deficit Hyperactivity Disorder National Institute of Mental Health's website with definitions, signs and symptoms, treatment, therapies, studies, and resources www.nimh.nih.gov/health/</p> <p>Brainwave Entrainment App by Banzai Labs Uses sequences of binaural tones to stimulate brainwave frequencies associated with various states of mind. Apps for focus, problem solving, concentration, memory, or reasoning. www.banzailabs.com</p>	<p>Children and Adults with ADHD (CHADD) www.chadd.org</p> <p>My ADHD General info and tools for assessment, history and symptom forms, tracking tools for progress, over 100 behavior and communication charts, articles, research, links www.myadhd.com</p> <p>Outside the Box Offers inspiration and info to educators and parents of kids with ADHD and related SLDs http://adhd.kids.tripod.com/index/index.html</p> <p>Planner Pad Organizers Time management tool (app, spiral bound, or loose leaf) to help you categorize, prioritize, and schedule www.plannerpads.com</p>

Autism Spectrum Disorder	
<p>Autism Speaks Dedicated to promoting solutions for individuals with ASD and families. www.autismspeaks.org</p>	<p>Autism Society Empowers everyone in the autism community with resources to live fully. www.autismsociety.org</p>

Laws	
<p>Americans with Disabilities Act (ADA) www.ada.gov</p> <p>Center for Parent Information and Resources Resources to help families with children with disabilities, funded by the Office of Special Education Programs (OSEP) at the U.S. Department of Education. www.parentcenterhub.org</p>	<p>Individuals with Disabilities Education Act (IDEA) www.idea.ed.gov</p> <p>Section 504 of the Rehabilitation Act of 1973 From the United States Department of Labor www.dol.gov/oasam/regs/statutes/sec504.htm</p> <p>Wrights Law USA Resource for understanding legal special education rights www.wrightslaw.com</p>

Assistive Resources for Education	
<p>30/30 App for Apple or Android Free fully customizable task list to help maximize every second of instruction, homework, or practice time www.itunes.com</p> <p>Snap Type App in iTunes for occupational therapy support and handwriting problems www.itunes.com</p>	<p>Read&Write for iPad by TextHelp! Alternative keyboard with integrated features to help with writing, reads online content and emails, uses colors, dyslexia font, upgradeable features http://apps.texthelp.com</p>

Books	
<p><i>The ADHD Advantage</i> by Dale Archer (Avery, 2015)</p> <p><i>The Dyslexic Advantage</i> by Brock and Fernette Eide (Hudson Street Press, 2011)</p> <p><i>Overcoming Dyslexia</i> by Sally Shaywitz (Vintage Books, 2003)</p>	<p><i>Music and Dyslexia A Positive Approach</i> edited by T.R. Miles, John Westcombe and Diana Ditchfield (Wiley, 2008)</p> <p><i>Instrumental Music for Dyslexics A Teaching Handbook</i> by Sheila Oglethorpe (Whurr, 2002)</p>

Assistive Resources for Music	
<p>Finale Music composition program with playback www.finalemusic.com</p> <p>GarageBand Music recording and editing program that allows students to record assignments in their home environment and submit online for a grade www.apple.com/mac/garageband/</p> <p>MusicTheory.net Online music theory and aural skills training www.musictheory.net</p> <p>My Note Games App Games for note reading practice www.mynotegames.com</p> <p>NotateMe App for Apple or Android The app intelligently learns students' handwriting as they notate on a staff, translates the handwriting into computer-generated notes, and plays back www.neuratron.com/notateme.html</p> <p>Practice Center App Includes video and audio recording, tuning drones, metronome, stopwatch, drum loops, and adjusted playback tempos www.practicecenterapp.com</p>	<p>Sibelius Similar to Finale composition program www.sibelius.com</p> <p>SmartMusic Interactive practice tool that allows students to record and play with accompaniments www.smartmusic.com</p> <p>Tempo SlowMo App for Apple or Android Slow down or speed up recordings without affecting pitch. Helps to slow down technical passages for practice with recordings. www.itunes.com</p> <p>YouTube Watch video performances or instructional music videos www.youtube.com</p> <p>Tonal Energy Chromatic Tuner App Includes tone generator, analysis of sound in wave form, recording and playback of tones, adjustable sensitivity and temperament, transposing capabilities, and a green smiley face when in tune www.tonalenergy.com</p>
Supplies	
<p>Fidget Toys or Other Supplies www.amazon.com www.officeplayground.com www.therapysoppe.com</p>	<p>Vibrating Pulse Metronome Soundbrenner Pulse Wearable Metronome Connects with a smart device www.soundbrenner.com or www.amazon.com</p>