

Linking Music, Language, and Literacy: Using Research to Create an Inclusive Music Classroom Accessible to Diverse Learners

- Introductions
- Relationships Between Music & Reading
- Research-to-Classroom Translational Framework
 - Rhythm and Timing
 - Pitch
 - Melodic and Rhythmic Notation

Welcome & Introductions

- Jennifer Zuk, PhD CCC-SLP
- Kathleen Gallagher, EdD
- Jessica Wyton, MA



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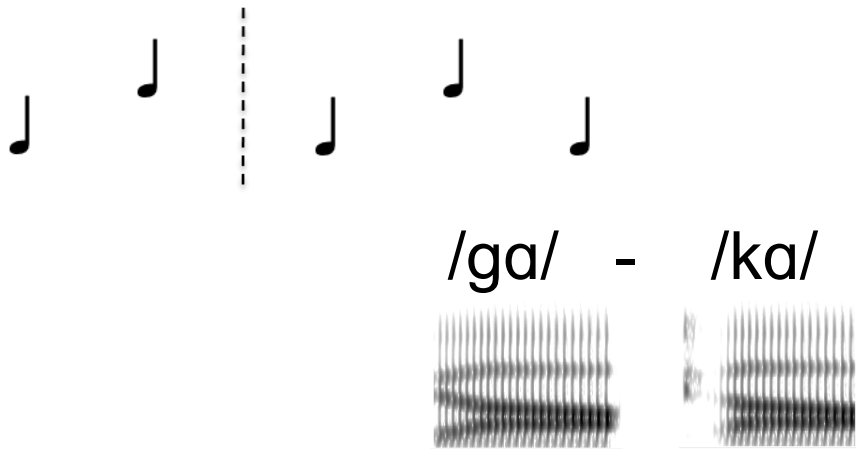
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Communication and Neurodevelopment Lab



Relationships Between Music and Reading



Say “cat” without
saying /k/



(e.g., Zuk et al., 2017; Corrigall & Trainor, 2011)



Musical Training → Improved Reading Skills?

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Other factors:
e.g., Improved
Attention? Executive
functioning?



Musical
Training

Improved
Auditory
Processing

Improved
Linguistic
Processing

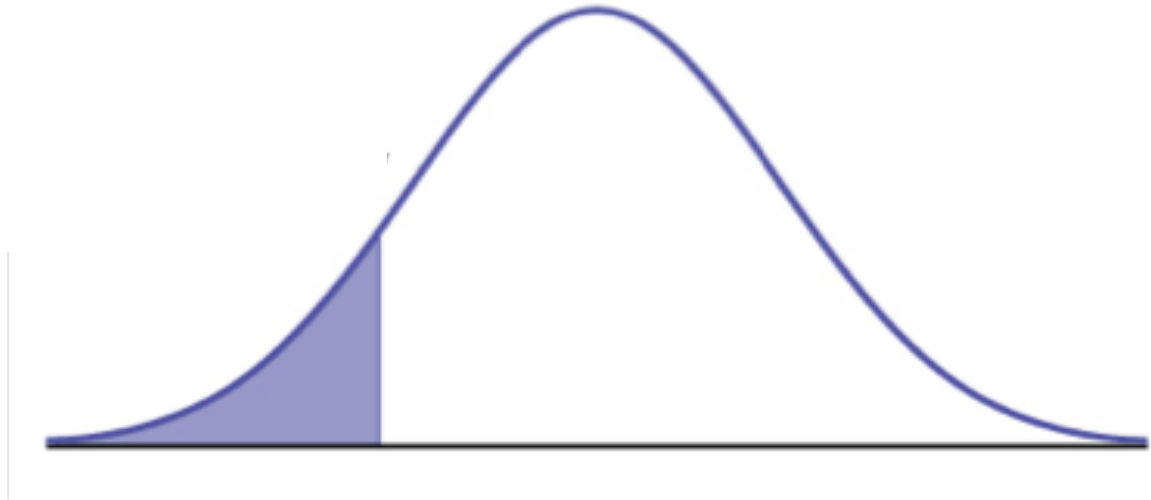
Improved
Language
Skills

Improved
Literacy
Skills



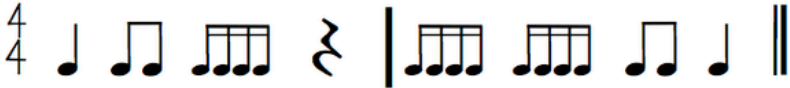
(Tallal & Gaab, 2006)

Baseline Music Aptitude Skills



- 32% of children scored within the 1st %ile
- Music aptitude skills significantly related to reading accuracy & fluency

Rhythm & Timing



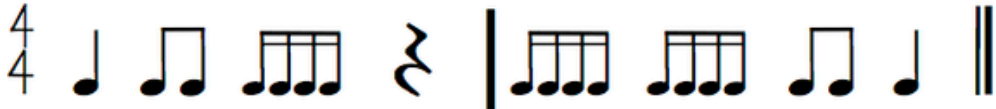
Pitch



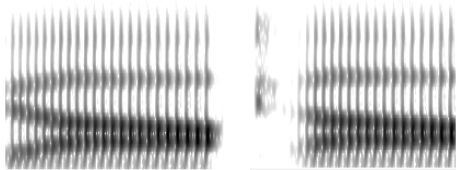
Melodic and Rhythmic Notation



Rhythm and Timing



/ga/ - /ka/



May
Day
Play

Say "cat" without
saying /k/

C-a-t
Ice Cream
x x

Rhythm and Timing: Research to Classroom

- Auditory-Kinesthetic: Call and response with increasing bar length and rhythmic complexity before adding rhythmic solfeggi
- Auditory-Kinesthetic-Visual: Mimic spoken prose through a variety of mediums like poems and short stories with and without a **metronome** or steady beat

Dom "Hold that whole note"	4
Ta-ah-ah	3
Ta-ah	2
Ta	1

- Kinesthetic-Visual: Apply rhythmic solfeggi and/or manipulatives to sentences and lyrics while reading and performing

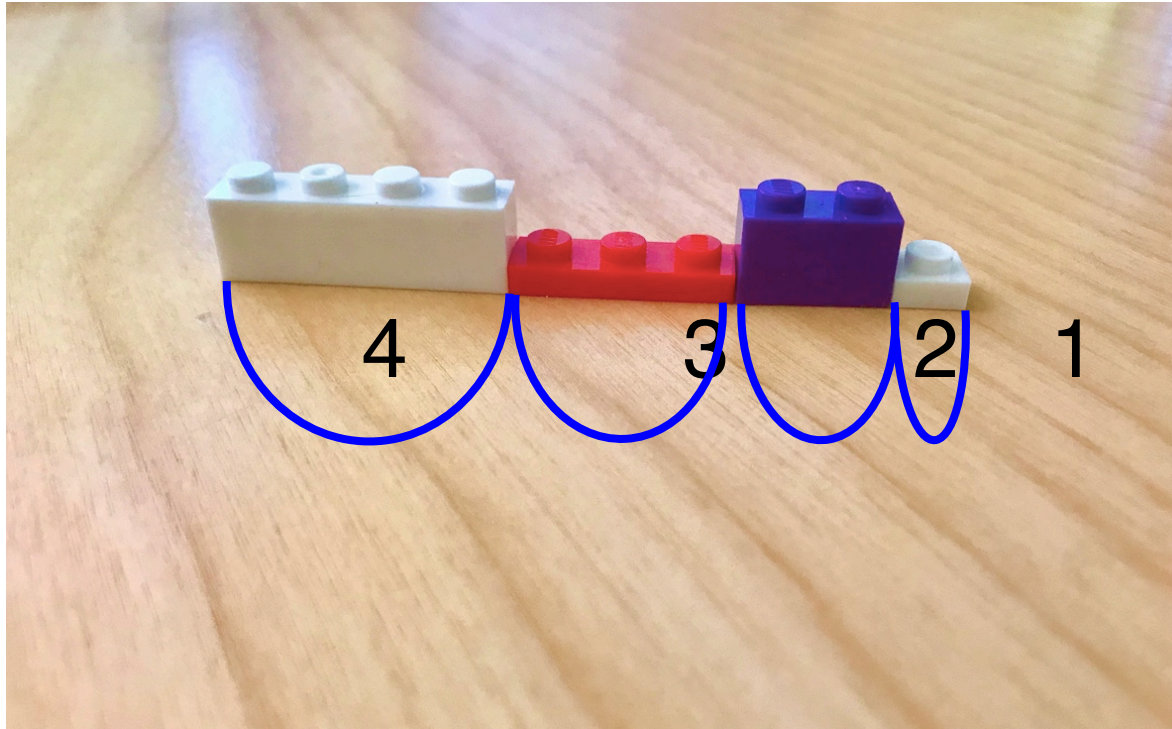


- Auditory-Kinesthetic
Clapping syllables
in speech and
student responses
throughout the class

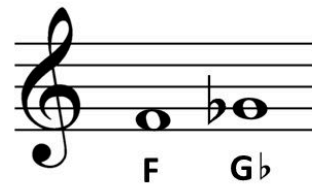
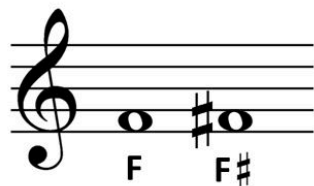
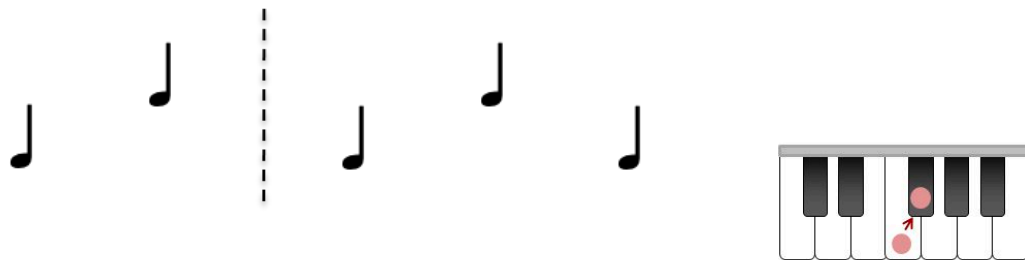


The image shows two examples of musical notation for phrases. On the left, the phrase "Hello!" is written in a bold, black, sans-serif font. Above it is a musical staff with two eighth notes, a quarter rest, and a quarter note. Below the text are two clapping hand emojis. On the right, the phrase "good morning!" is written in a bold, black, sans-serif font. Above it is a musical staff with a quarter note, a quarter rest, and two eighth notes. Below the text are three clapping hand emojis.

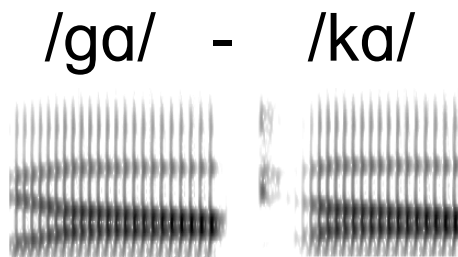
Rhythm and Timing: Research to Classroom



Pitch

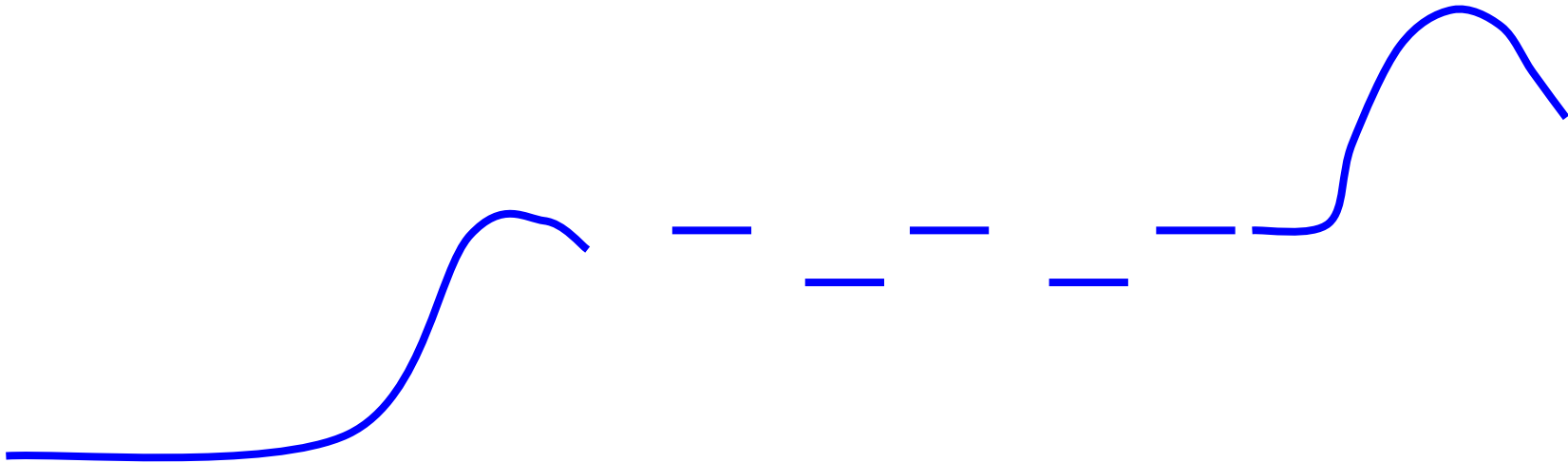


Conduct
Conduct



- Identifying changes in pitch
 - Auditory-Kinesthetic - identify high vs. low pitch with body (i.e., ascend to stand, lower your body to descend, air writing of ascending and descending lines in a call response)
 - Tactile - Depict descending vs. ascending lines (drawing something at the bottom of a paper vs. the top, pipe cleaner manipulation)

- Visual - Depict ascending and descending melodic lines with changes in rhythm



- Auditory-Tactile - Use manipulatives or fixed-pitch instruments to show changes in the intonation of words



Melodic and Rhythmic Notation

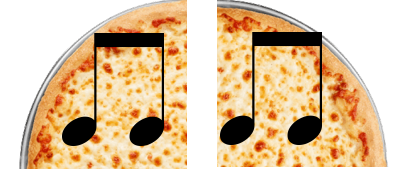
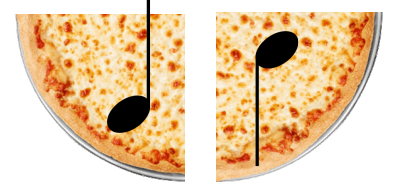
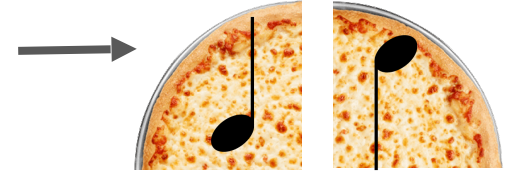
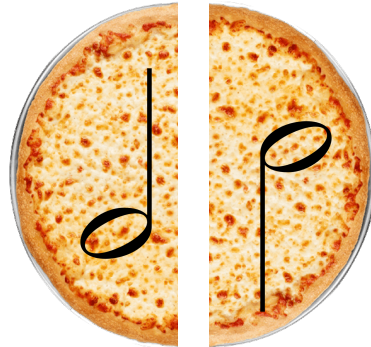
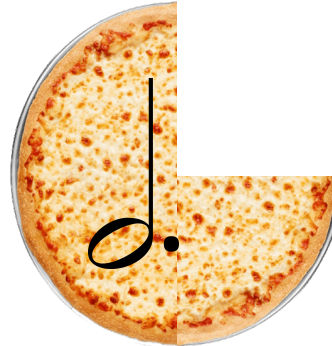
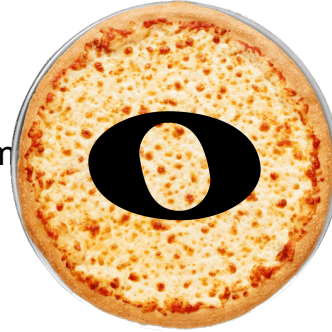


Learning musical notation involves the acquisition of key skills necessary to read written text, such as:

- Sound-symbol correspondence
- Left-to-right and row-by-row systematic visual scanning
- Multisensory approach to learning notation

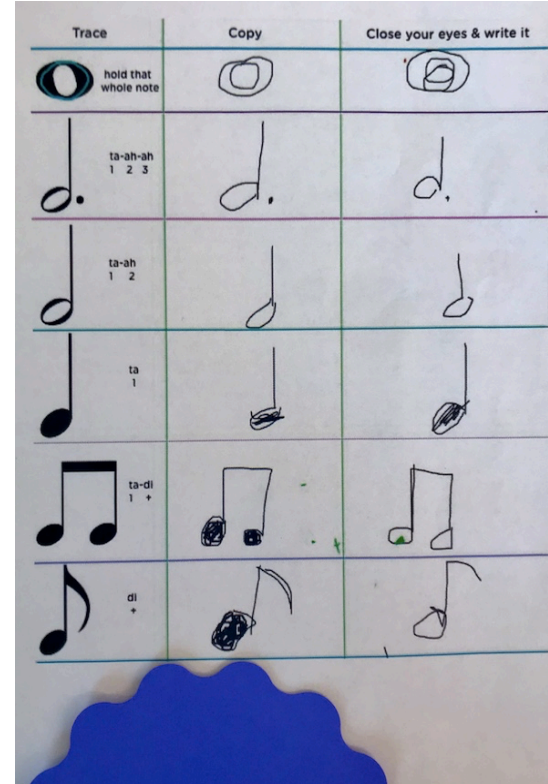
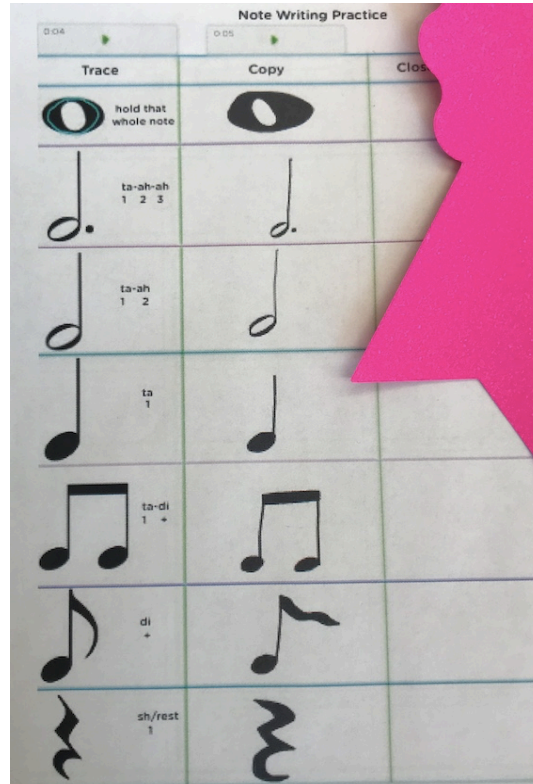
Melodic and Rhythmic Notation: Research to Classroom

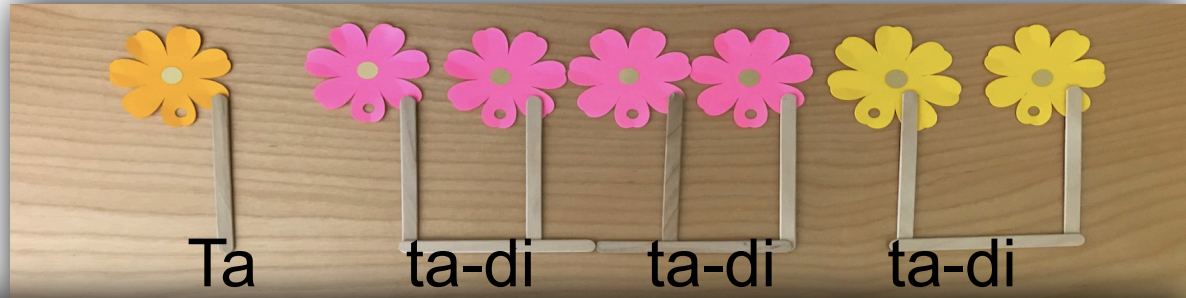
- Scaffold previously learned rhythmic drills, but substitute with a sound-symbol correspondence



Melodic and Rhythmic Notation: Research to Classroom

- Kinesthetic -
Trace, Copy,
Cover notation
while saying
the rhythmic
solfege aloud



Melodic and Rhythmic Notation:
Research to Classroom**Spoken Prose**

Spring show-ers bring May flow-ers

Steady Beat

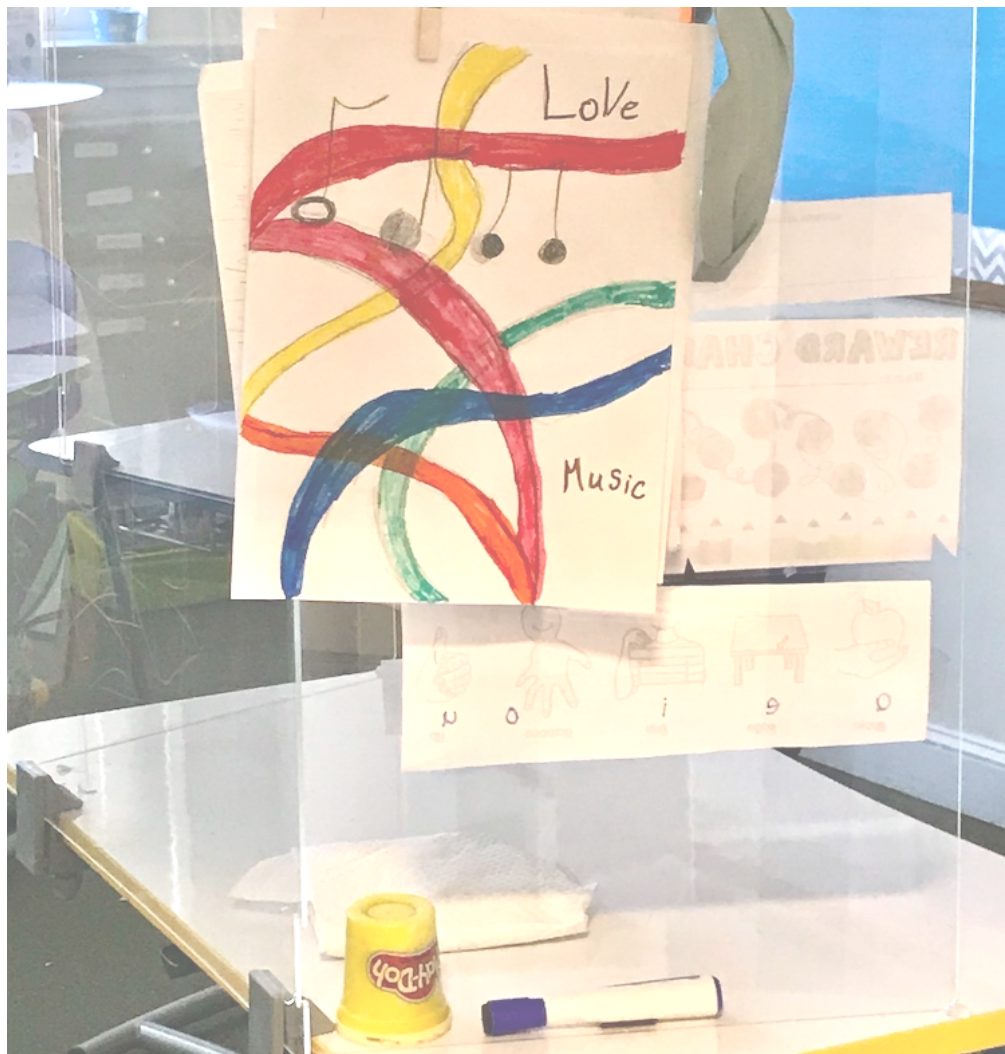
Melodic and Rhythmic Notation: Research to Classroom

- Color-coded melodic notation

Remember the acronym: ROYGBIV



Wrap up



Please enjoy this infographic on Music, Reading, and the Brain included with the information for this session!

Music, Reading, and the Brain

Jennifer Zuk, PhD & Nivedita Ravi

How does musical training relate to children's cognitive, language, and reading abilities?



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Pitch and Timing: Important for Both Music and Language

Our ability to perceive changes in pitch (tones) and timing (e.g., rhythmic patterns) is not only important for music but also language. Precise pitch and timing changes in spoken language allow us to recognize individual speech sounds within words, distinguish between different words, and ultimately comprehend the meaning of full sentences.

Pitch

Pitch perception skills in music have been positively linked with foundational language skills for learning to read, such as phonological awareness (the ability to recognize individual speech sounds within words, such as /c/ /a/ /t/ in the word /cat/).¹ Long-term engagement in musical training has been shown to improve children's abilities to discriminate pitch changes in not only music but also in language.²



Timing

Children with reading difficulties have demonstrated increased difficulty perceiving timing changes in both music and language compared to their typically developing peers.² When provided musical training in conjunction with traditional reading instruction or intervention programs, children with reading difficulties have demonstrated improvements in phonological awareness and word reading abilities.¹



Reading Music

Similar to written text, musical notation requires mapping sounds onto visual symbols. Early evidence suggests that learning to read musical notation may bolster sound-symbol mapping and interpretation of a written code.³

Shared Cognitive Processes Underlying Music and Reading

Musical training requires higher-order cognitive processing (e.g., goal-directed behavior, planning, inhibition, task-switching) to coordinate and produce music in real-time, and these cognitive skills are known to be important for reading and academic engagement. Musically trained children show heightened cognitive abilities compared to those without musical training,⁴ and longitudinal investigation suggests that musical training can improve these higher-order cognitive skills.⁶



Music and the Reading Brain

Beyond behavioral relationships between music, language, and reading, neuroimaging offers the potential to understand the brain mechanisms that underlie these associations. Neuroscience research suggests anatomical overlap in the brain regions responsible for processing pitch and timing in music and language.⁵ In addition, recent research has found that musically trained children show greater brain activation compared to unmusically trained children and those with dyslexia in brain regions known to be important for reading.⁷



¹Flagnacco, E., Lopez, L., Terribilli, C., Montico, M., Zola, S., & Schön, D. (2015). Music Training Increases Phonological Awareness and Reading Skills in Developmental Dyslexia: A Randomized Control Trial. *PLoS One*, 10(9), e0138715–e0138715. <https://doi.org/10.1371/journal.pone.0138715>

²Gowran, U., Bhan, M., Mead, N., Fosker, T., & Vernon, J. P. (2013). Perception of patterns of musical beat: Shifts in phonological developmental dyslexia: Significant longitudinal relations with word reading and reading comprehension. *Cortex*, 49(5), 1363–1376. <https://doi.org/10.1016/j.cortex.2012.05.026>

³Gratchew, L., Lloyd-Jones, J., & Miles, T.R. (2014). Dyslexia and Musical Notation. *Annals of Dyslexia*, 64(1), 105–122. <https://doi.org/10.1007/s11868-013-0144-4>

⁴Loft, P., Kravitz, K., Zuk, J., Winner, E., & Schlaug, G. (2011). Relating pitch awareness to phonemic awareness in children: Implications for tone-deafness and dyslexia. *Frontiers in Psychology*, 2, 111–111. <https://doi.org/10.3389/fpsyg.2011.00111>

⁵Patel, A. D. (2011). Why would Musical Training Benefit the Neural Encoding of Speech? The ORELA Hypothesis. *Frontiers in Psychology*, 2, 142–142. <https://doi.org/10.3389/fpsyg.2011.00142>

⁶Schellenberg, E. G. (2006). Long-Term Positive Associations Between Music Lessons and IQ. *Journal of Educational Psychology*, 98(2), 477–486. <https://doi.org/10.1037/0022-0663.98.2.477>

⁷Schön, D., Magno, C., & Resnan, M. (2004). The music of speech: Music training facilitates pitch processing in both music and language. *Psychophysiology*, 41, 341–349. <https://doi.org/10.1111/j.1469-8986.2007.01722.x>

⁸Whitney, E., & Tamm, J. (2006). The role of prosodic sensitivity in children's reading development. *Journal of Research in Reading*, 29(3), 288–303. <https://doi.org/10.1111/j.1467-9817.2006.00309.x>

⁹Zuk, J., Benjanin, C., Kravitz, A., & Gahl, N. (2014). Behavioral and neural correlates of executive functioning in musically and non-musically. *PLoS One*, 9(6), e99868–e99868. <https://doi.org/10.1371/journal.pone.0099868>

References (abbreviated, see handout for more)

- Corrigall, K. A., & Trainor, L. J. (2011). Associations between length of music training and reading skills in children. *Music Perception*, 29(2), 147-155.
- Tallal, P., & Gaab, N. (2006). Dynamic auditory processing, musical experience and language development. *Trends in Neurosciences*, 29(7), 382-390.
- Zuk, J., Bishop-Liebler, P., Ozernov-Palchik, O., Moore, E., Overy, K., Welch, G., & Gaab, N. (2017). Revisiting the “enigma” of musicians with dyslexia: Auditory sequencing and speech abilities. *Journal of Experimental Psychology: General*, 146(4), 495.