

## BACKGROUND

**BACKGROUND**

- Why do most rhythmic studies in music solely examine steady beat? Fluctuations in tempo naturally occur in music and require musicians to perceive and adjust. Musicians are regularly called upon to exercise the ability to synchronize their bodies and voices to the beat, with and without other musicians.
- With roots in psychology and biology, the cognitive implications of synchronization continues to gain attention in the neurosciences (Patel, 2006; Mesoudi, et al, 2009; Phillips-Silver & Keller, 2012).
- This ability to synchronize one periodic beat with another, also known as **rhythmic entrainment**, is described as being at the core of collective musical experiences (Clayton et al, 2004).
- Little transfer and application of the phenomenon has been addressed in music education.

## AIMS

- Gather and assess literature within the past 15 years that comment on cognitive, cultural, and social processes of entrainment
- Synthesize how current findings could be applied in an accessible and practical manner for music teaching and learning.

These connections prove beneficial in determining which rhythmic skills are most pertinent in music teaching and learning, and the manners in which we acquire and apply them.

## MUSICAL EXAMPLES



- Rhythm section members tend to move their head up and down when playing a groove-oriented beat. Structures within the ear may play a key role in how auditory rhythms are processed (Phillips-Silver & Trainor, 2008).
- Musicians often use expressive body gestures to convey the timing or the feeling of motion in the music (Thompson, Graham, & Russo, 2005).
- A violin section watches the concert master's bow movement and synchronizes their own bows to the periodic movement.
- Chamber musicians position themselves in a manner close in proximity and conducive to eye contact, enhancing their communicative bond and providing a heightened level of interaction (Williamon & Davidson, 2002).
- A musician notices they are playing faster than a digital metronome, and subsequently adjusts by slowing the scale pattern to synchronize with the beep.
- Examples of cues that may be highlighted for young musicians include looking up for a conductor's beat 1, or directing attention to fellow performers as they slow down at the end of a phrase

## PEDAGOGICAL CATEGORIES

### MUSICAL AWARENESS

#### Example 1

*The Dynamic Attending Theory (Jones & Bolts, 1989) was formulated to explain how people respond to periodic events. The internal beat, or attending rhythms, can be synchronized by targeting specific points in time, through anticipation, and in response to expectations being met.*

Application: Students who practice with a metronome develop a greater awareness to regularly occurring beats. Their increased sensitivity to when a beat appears allows for adjustments to the “ebb and flow” of music.

#### Example 2

*The Metric Binding Hypothesis (Jones, 2008), a follow-up to the Dynamic Attending Theory, addresses training and enculturation. When a beat or group of beats are played at the same time, they will synchronize or lead to binding.*

Application: A teacher playing with a student over a period of time will aid in successful entrainment. Teachers can model the desired rhythm, or even play complimentary rhythms in phase with the desired rhythm. Practicing along to EDM (electronic dance music) may capitalize on the Metric Binding Hypothesis.

## Adjust

*Musicians are regularly called upon to exercise the ability to synchronize their bodies and voices to the beat, with and without other musicians.*

### RECOGNIZING STUDENTS

#### Example 1

*The vestibular system, including the cochlea and inner ear, may be particularly important to the rhythmic and metric learning process (Malloch and Trevarthen, 2009; Phillips-Silver & Trainor, 2008, 2012).*

Application: Research regarding the vestibular system would suggest that having students bob their heads in time with the beat would be a more significant approach to internalize the tempo than tapping their toe.

#### Example 2

*Studies discussing the importance of culture on beat perception (Hannon & Trehub, 2005; Hannon & Trainor, 2007) serve as the basis for hypotheses (Kirschner and Tomasello, 2009) which predicted cultures that provide more active and social applications of synchronization skills would be further developed than those more situated in electronic stimuli experienced outside of a social context.*

Application: A culture where music is present in a social context, early and often at home, may produce different results than a culture where music is first meaningfully experienced with an iPod and headphones at a later age. Access to music has a significant impact on development.

## PEDAGOGICAL CATEGORIES (cont.)

### COMMUNITY THROUGH RHYTHM

#### Example 1

*The act of entraining may play a role in connecting people and can create the experience of belonging and community (Cross, 2005; Wiltermuth & Heath, 2009). Social implications of entrainment include communal bonding (Macrae et al., 2008), and its effects can enhance social rapport.*

Application: Teachers often use echoes and call-and-answer to teach by rote. Synchrony may facilitate imitative learning, action understanding, and the acquisition of personal knowledge. Active synchrony was even reported to increase information retention.

#### Example 2

*Repp & Penel (2004) report that the presence of a play partner should increase motivation and facilitate the understanding of the task and how providing auditory feedback by playing with students may be more effective than conducting. Kirschner and Tomasello (2009) demonstrated children's ability to spontaneously and willingly adjust their drumming tempos beyond previously described limitations in their range of tapping tempos.*

Application: Teachers who play along with their students may find more success than having them simply play to a metronome. They may even guide their students to rhythmic synchrony by speeding up or slowing down to the desired tempo.

## CONCLUSIONS

- The human desire to feel a sense of belonging and unity shares similar motivations with rhythmic synchronization.
- Teachers develop individuals with important social skills and attitudes. By tapping into human interaction and innate behaviors such as entrainment, perhaps both can be mutually beneficial to the other.
- Studies in entrainment demonstrate its value and effectiveness in music learning and teaching, and the manners in which we acquire and apply them. Furthermore, the social implications and desire for humans to connect are additional considerations when engaging students in joint activities.

## AREAS OF FUTURE STUDY

- Practical ways of assessing and recognizing students' Spontaneous Motor Tempo (SMT)
- Models for teaching entrainment, perceiving and adjusting attending rhythms
- Catalog of SMT for a range of students K-12 and college-age students, considering age, culture, and formal training
- Further examination of how visual stimulus affects synchronization

## ACKNOWLEDGEMENTS

Special thanks to Dr. Beatriz Ilari for her continued guidance and generosity of time.