

What is the influence of music on performance in practice and competition among university
competitive fencers?

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Abstract

Fencing as a sport and music as an expressive form are two topics that may seem very distant in comparison, but both have many aspects that are intertwined. The purpose of this study was to understand how music is used within practice and competition settings and how rhythm, tempo and timing in fencing might be influenced by music. This study used grounded theory and its three-phase thematic analysis and applied a social-constructivist lens. The research question was: What is the influence of music on performance in practice and competition among university competitive fencers? The participants were interviewed using semi-structured interviews and the researcher kept retrospective notes on observations as an insider to the fencing community. The main findings were split into two groups that included practice and competition. Practice music influence showed that music was used to increase motivation but could also cause distraction from the practice. It also showed how one learned to develop fencing rhythm using music, and how auditory cues from music and from saying sounds that correspond to physical movements help with development of timing. Other findings were that fencers have practice structured around the way they learn, moving from learning in parts to wholes or easy to complex. Also noted was that each weapon has its own style that is free to be discovered and developed. Competition music influence was discovered to be almost non-existent other than for the use of pre-competition preparation and was used sometimes between bouts for relaxation purposes. Other findings were that due to external stressors, fencers tend to not be aware of what their body is doing. In their minds, the action feels correct, but it might have been too big or small or too fast or slow. Also, partner rhythm within a competition is difficult to manipulate as both opponents are trying not to follow each other's footwork. Music seems to have an influence on those who use it to their advantage, but is connected to the athletes, coaches, and their way of learning.

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What is the influence of music on performance in practice and competition among university competitive fencers?

Introduction

Fencing as a sport and music as an expressive form are two topics that may seem very distant in comparison, but both have many aspects that are intertwined. Rhythm, tempo, and timing may all be musical terms but when combined with fencing, they make the average athlete into an athlete that can overcome even the toughest of opponents. For my research, I am looking at music in relation to the Olympic sport of fencing, specifically, what is the influence of music on performance in practice and competition among university competitive fencers. The purpose of this study is to understand what role music may or may not play into a fencer's practice or performance. I am also interested in learning about how rhythm, tempo, and timing might be influenced by music. Not everyone will hear music the same way as others, and it is just the same towards fencing. Not everyone who fences does so the same way as others. I am interested in diverse findings as the nature of the sport and music are not reliant upon conjoined senses, but different realities.

It is important to distinguish between practice and performance within fencing. Practicing within fencing is doing repetitions and moving from part to whole learning or simple to complex actions to learn and improve fencing skills. This helps develop the fencer's automaticity of fencing movements. Performance in fencing is when one is bouting against an opponent in competition. Performance in bouting is less repetitive and more reactive. It is unregulated due to each fencer having their own goals within a competition thus making each action happen with a purpose while trying to remain hard to read and attempting to surprise their opponent. To understand if and how music plays a role in a fencer's practice or performance, we need to

understand how music plays a role in learning. “Music is socially acceptable, healthy, inexpensive, and ubiquitously available. It has the unique potential to benefit students’ learning and well-being, particularly in terms of emotion modulation, changing behaviours, and improving task performance and engagement” (Hu et al, 2021. P. 1). With music being easily accessible and available to most of the population, many people listen to music throughout their day-to-day lives. Within standard fencing practices in the university cohort, music will normally be played in the background leaving it completely up to the fencer to choose to listen or drown out the sound. Hu et al. (2020) found that the most significant properties of music listening and learning occurred during relaxation, boredom reduction and concentration improvement, and while studying or practicing. Having the music in the background is sometimes helpful to those needing to fill empty spaces or long silences. Music has many terms that are interchangeable with many different aspects of sport such as timing, tempo, counter time, and rhythm.

Rhythmic accompaniment often helps with physical movement and helps with performance (Hallam, 2010). Music has the potential to improve performance and I would like to take a deeper dive into this assumption as it would help the fencing community. Plato, a philosopher during the 5th century, suspected practicing and /or listening to music can improve brain function (Misuraca et Al, 2017). “Cognitive abilities seem to be influenced by the background music played while listeners are performing a cognitive task” (p.109). Having background music seems to fill a gap in some minds while working in silence seems to be a hindering factor with concentration. Noise of any kind may be distracting or beneficial depending on the person. Tempo and timing are integrated within all sports as they are a part of the strategies of the game, but with fencing, it is a necessity to have quick timing with a regulated tempo to score points and win bouts. Too quick a tempo, and the fencers will become

tired and miss crucial opportunities to score; too slow a tempo, and fencers will have a limited reaction time to an opponent's attack. This research took a deeper dive into understanding how timing, tempo, and rhythm are consciously and unconsciously intertwined within fencing, and how 'fencing time' - meaning the time required to perform a simple action-is within its own category that is both within the fencing world and the music realm.

Literature Review

Fencing Background and Context

Fencing is one of four sports that has been included in every modern Olympic Games since 1896 and has only continued to grow over the years in interest (Thompson et al, 2021. p. 1). Fencing is continuing to be a growing sport in North America and is one of the safest sports in the world due to its restrictions of behaviour and safety equipment fencers need to wear (Thompson et al, 2021). Increasingly it is also being recognized as an inclusive sport since many different body types, diversity profiles and processing preferences can be included, usually with minor modifications. The equipment required for fencing includes, shoes, knee high socks, fencing pants, fencing jacket, fencing half-jacket worn under the jacket, mask and one glove for sword hand. In Olympic Fencing, there are three different disciplines, épée, foil, and sabre.

Épée is the weapon most like actual dueling. Like a rapier, hits are scored anywhere on the opponent's body as if it were a real sword, but only using the tip of the blade. In addition to it being close to a real sword, two hits can be scored at the same time. Épée is the slowest of all three disciplines. Foil, like the épée, was shaped from a nobleman's court sword, meaning a light defensive weapon. Since the focus of foil was to practice defence, hence fencing, hits can only be scored by hitting the torso of the body using the tip of the blade but only if those hits are landed from the first attack or last defence. The last weapon, sabre, is different from the others. It

is descended from the cavalry sabre, and hits are scored through slashing and thrusting. Due to its roots with mounted cavalry officers, hits are scored anywhere above the waist. Sabre is the fastest of the disciplines.

In both foil and sabre, priority is a factor. Priority means the right of way. Fencers may only score points if they can land an uninterrupted and continuous action. For example, if fencer A lunges for an attack and fencer B happens to parry, or block, the action, and both fencer A and B land the attack, fencer B would receive the point because they had the last uninterrupted and continuous action. With the priority rule, fencers need to have a good sense of timing to land attacks. When fencing in a competition, the referee is the one who makes the call for who has gained priority or not. In short, the fencer who normally gains priority is the one who was the first to move off the on-guard line and continuously remains within the attacking position, meaning moving forward or attacking without pulling the sword arm back, until an attack is landed, missed or parried by the opposing fencer. “In a fencing match, it is important to move swiftly and score while avoiding the opponents attack and guard” (Kim et al, 2015. p.1). This statement is true for all three disciplines as you need to outwit your opponent. “Often compared to physical chess, fencing is a sport that requires a combination of athleticism, strategy and stamina” (Thompson et al, 2021. p. 1).

Footwork basics are the same across all three fencing disciplines. Basic steps include thrust, an extension of the sword arm, forward steps and backward steps, lunging, and advance lunging, a combination of a forward step and a lunge. Moving beyond the footwork basics, there is also bladework that is needed to be combined with footwork basics. Bladework includes simple or direct attack, parry, feint, combined attack, parry and riposte, remise, reprise, and counterattack or counter time. The combination of bladework and footwork make timing, tempo,

and rhythm very important, especially when done within each discipline. The combination of footwork and bladework make up the distance needed to hit the opponent; this is why it is important to lead the attack with your sword arm rather than your feet. Leading with the arm first, or thrusting, can let you know how far away you are from your opponent and then you can make up the distance with your footwork. Attacks in fencing are needed to be quick and, in some case, precise, but the build up to each attack differs from each discipline. For épée, the slower of the weapons, attack set up takes time and requires patience. For foil and sabre, attack set up is done quickly due to the nature of the priority rule. Foil has slightly more time to plan as you score with the tip of the blade but sabre scores with the entirety of the blade leaving minimal room for planning.

Each discipline has its own unique factors and requires a different sense of timing to score points. Timing and tempo are immersed into the sport naturally, but the development of these tactics take a great deal of time to learn. Czajkowski (2009), explains that tactical capabilities are closely connected with technique and other factors of training but the ‘feeling of surprise’ or changing the timing expectation within the established tempo is the most beneficial element to the fencing sport. It is important for fencers to learn the basics of fencing to improve skills with blade and footwork and to choose the correct attack or defence during a bout, but the chosen attack or defence can be meaningless if not done at the correct time. Generally, if a fencer is caught by surprise, is off balance, and not fully concentrating on the actions, then the attacking fencer has chosen the correct tempo (p. 244). In order to break tempo or have a good sense of timing, a fencer must be able to set the tempo themselves. Regardless of the weapon, the development of tempo within a bout depends on who may have a better sense of rhythm of the sport according to each fencer’s style. For example, within épée, the rhythm is normally slower

due to the nature of the weapon, but the rhythm of the bout can be increased or decreased depending on the fencer themselves. The stronger the sense of rhythm, the better the fencers can break the tempo of their opponent.

Barth and Beck's (2007) *The Complete Guide to Fencing* describes various fundamentals of fencing technique, strategy and tactics, methods of training, and weapon specific strategic elements that are required for teaching and coaching this sport to youth and experienced fencers. The authors explain how fencing should be taught to progress fencers through each component of fencing starting from basics to complex actions, strategies, tactics, and methodology in the fencing realm. "Fencing technique is described as a method for resolving a combative task and together with cognition, analysis of the combative situation, a strategic-tactical component, and mental resolution to overcome opponents and develop skills farther." (Barth and Beck, 2007. p.46) Technique is a decision made regarding the direction of the engagement of the motor movement and reliability of the implemented action (p. 46). Technique takes a great deal of time to develop and perfect, if, that is, perfection of technique is possible. Technique is not just development of physical actions, an external model, but includes internal attributes such as, mental or movement visualization, to adapt to a constantly changing environment. This shows that basic technique in fencing training can always be improved upon.

Basic fencing technique includes two different categories that are used simultaneously. These are positions and movements. This is then further broken down into body positions/movements and weapons positions/movements. Positions are the starting and endings within fencing bouts and are frequently repeated throughout the course of the match. Movements are the gaps in between each position. These are various forms of locomotion such as forward and backward steps, lunges, and leaps. Again, these positions and movements are split into two

subcategories making basic fencing technique rather complex to learn quickly but can always be improved upon once graduated on to more complex movements. Fundamentals of any sport are important but can be overlooked. Fencing basics are continuously worked on and if a student is having difficulty on a new, complex body/weapon position/movement, basics will always make the transition easier.

“Rhythm of movement is dependent on the temporal-dynamic parameters of the technique, time structure, dynamics of acceleration and deceleration and the duration and intensity of force impulses.” (Barth and Beck, 2007. p. 66)

Strategies and tactics are learned based on a fencer’s personal strengths and weaknesses, and possible behaviour patterns of opponents. Strategies can be made in short, medium, and long-term training plans. Strategies are the plans made to overcome opponents, whereas tactics are the preparation of those plans. This involves proper placement of the body and weapon needed to use the proper strategy. Coaches often show students different options for different fencing positions, specifically with bladework, to still have the same strategy outcome even if a fencer misinterprets an opponent’s first action. For basic methods of training, Barth and Beck describe how fencers can train appropriately based on skill level, whether they are independent or with a training partner, or one on one with a coach. Barth and Beck provide different scenarios for each fencer and how to progress fencers through training goals, content, and means. Finally, Barth and Beck, breaks down each weapon and explains all components from all attacks, defences, and complex actions.

Shaw’s (2008) article describes sequences of progression steps for learning fencing, specifically foil, for those in elementary school grades 3, 4, and 5. This progression of steps is also often used in college-level physical education classes. The author discusses psychomotor,

organic, intellectual, and character attributes of their participants to help develop fencing skills and potential tactical approaches to fencing. Psychomotor sections speak to the footwork remaining independent and disconnected from the upper body. Shaw then moves through single actions of footwork, combinations of footwork and game like footwork, then into bladework to work separate from footwork in the same fashion as the footwork sequence, and a combination of both. Shaw describes an organic section that focuses on how the session should be run, to simulate how fencing is high intensity, endurance, and short bursts of actions. Intellectual attributes refer to the knowledge of the game and tactics used to win. (i.e., timing, tempo, rhythm, and element of surprise). Finally, the character domain refers to one's learning aspects, their character, fair play, teamwork, and so forth.

Learning, Sensori-motor learning, Tactics and Strategy

With fencing being an asymmetrical sport that requires tactical abilities, motor learning plays an important role in progression in this sport. More specifically, focus of attention has its own roles within fencing. Focus of attention consists of external focus, meaning the performer's attention is directed to the outcome of the action, and internal focus, where the performer's attention is directed at the action itself. (Wulf et al. 2001) Within fencing, it is important to focus on one action at a time but also to have a plan once that action is finished. A fencer's ability to focus both externally and internally improves their overall performance when fencing in competition. External and internal focus is learned within practice where single actions are learned individually and practiced first. Internal focus is not just looking at the action alone, but how the action is developed throughout the entire body. This includes how the body's weight will transfer from steps to lunges or the amount of force production needed to reach the target. Once there has been internal focus established on some single actions, these will be combined

into a specific sequence in a controlled setting (i.e., working with a coach where they provide the openings for the next action). This works on the external focus component of fencing actions. Once external and internal focus have been worked on, fencers are then placed into a random setting, (i.e., bouting on piste) where this requires the most focus of attention as openings are not as easily spotted and do not remain open for long. The difficulty in focus of attention is choosing the correct timing for skills to occur. Although, practice under these circumstances can be made beneficial to the fencer, if the fencer is unable to develop the correct timing, then the skills will be lost in the backlash of a more advanced opponent.

Milic, Janicijevic, Nedeljkovic, Cuk , Mudric & Garcia -Ramos (2020) discuss giving different sets of instructions during different bouts of fencing. They looked at the efficiency index which covers reaction time, attack velocity, and absolute error. To measure this, they used instructions that directed attentional focus with internal focus being “react as fast as you can” or “attack as fast as you can” and external as “be as accurate as possible”. The authors found that the type of direction can be a general index of attack efficiency, but external focus was more beneficial.

Borysiuk and Waskiewicz (2008) discuss perceptual processes involving vision, touch, and hearing and how it influences reaction time, movement time and muscle tension (EMG) in novice and advanced fencers. The authors found that tactile stimulation was the quickest reaction time followed by acoustic and then visual for all fencer levels, but advanced fencers had better times than the novices for all three perceptions. This is related to my study as it looks at perceptual motor skills and how these kinds of stimuli are related to offence and defence in combative sports. In fencing, fencers often use sounds and movement to throw off another fencers' tempo by slamming the front foot before making a movement or feinting to a spot on the

body then going for a different spot. They are looking for that reaction to break their opponent's timing and gain distance. Perceptual skills enable athletes to respond to important signals in sport competition and ignore disrupting ones which lower the effectiveness of sports combat.

Czajkowski (2011) examined the importance of extrinsic sensory motor skills, such as offence, defence, and counter-offence, and how the importance of performing the sensory motor skill is just as important as selection of the correct timing for said action. This article explains different types of sensory motor skills used during fencing bouts. These include:

- a) Simple: the response is known; the foreseen action is followed by the known foreseen response.
- b) Choice: the response can vary on several different actions.
- c) Differential: one must differentiate and act accordingly to the stimuli that is like its original variation.
- d) Sensory motor response to pre signal: the reactions are to the pre signals, not to the final actions.
- e) Sensory motor response to a moving object: the assessment of speed and trajectory of an object or one's extension of the body.
- f) Switch over responses: changing course of action due to an unexpected reaction from an opponent.

This research explains how decision making in fencing is difficult. If we relate this to music, we could say that the tempo, or fencing tempo, is never set to a consistent time frame, it is always dynamic to the situational tasks. Tactics and the element of surprise are directed by these sensory motor responses and can change how one wins the match.

Czajkowski (2009) explored how the variety of preparatory actions can lead to successful execution of actions to score points in fencing. Understanding when to use the correct preparatory action is crucial for any fencer's success within the sport. The difficult part is working on the timing of each preparatory action followed by the sensory motor response to complete that action. The preparatory actions include:

- a) Reconnaissance/exploratory actions: this is exactly what it says, watching your opponents while off the strip and exploring to see how your opponent will react to specific movements.
- b) Concealing one's own intention: this is a protection from other's reconnaissance, hiding one's true actions until fully necessary.
- c) Misleading the opponent: along with hiding your true actions, this can lead to psychological struggle since your opponent in trying to understand your tendencies.
- d) Directing the opponent's game: taking advantage of the opponent's mistakes while also creating the environment that positions the opponent to make mistakes. This means that fencers take control of their own actions by not using direct attacks all the time but wanting their final attack to be a counterattack.
- e) Maneuvering on the strip: position on the strip is important and can cause changes in how one attacks. Being placed at the end of the strip leads to rushed actions or shorter actions. This can be both good and bad depending on each side.
- f) Hindering the opponent's game: the ability to control rhythm of one's movements and by using one's rhythm to influence the lack of concentration on their opponent.

Rhythm and learning

Wang (2010) discussed how rhythm is needed to coordinate all movements as well as for accuracy. Rhythm is a crucial piece of information that is often missed by learners. The author explains how one might teach rhythm in sport to aid in skill acquisition and execution. This includes having someone demonstrate the skill with auditory cues, both verbal and sounds of the movement, and then move through the sequences of learning skills. Practice the skills with rests in between, practice independently the skill being learned, and decrease feedback to enhance the rhythmic component of the skill. Once performers are aware of how the movement should sound, a coach then lets them listen to their own movements. In fencing, each movement has its own proper 'sound' it should make during footwork, a rhythmic sequence for more than one action and a physical sound. Allowing for this auditory cue to happen within the lesson will aid in performance in practice bouts and competition.

Dalby (2005) describes how to teach rhythm within a music class, as it is not consistent from context to context because everyone processes rhythm differently. Rhythm should be taught based on audiation, meaning how it sounds not how it is notated. Further, since everyone learns in different ways, having a variety of learning experiences will benefit everyone. If the mathematical approach to rhythm works for some, then continue to use it. There are other equally effective approaches, for example, using a rhythm-syllable system that allows for associations with speaking. Linking syllables provides a vivid way of experiencing rhythm. For example, when someone is learning how to properly play triplets on a musical instrument, the word 'blueberry' is used to help bridge the three-note pattern within a two-note duration. Fencing footwork consists of its own sounds and can be learned through visual demonstration with the sound to help with the rhythm of the movement.

Karageorghis, Lyne, Bigliassi and Vuust (2019) describe rhythm complexity and the accuracy of dance performance. They looked at trained dancers and non experienced dancers to see different levels of auditory syncopation, syncopation being the lack of events on strong beats and placement of stressed events on weak beats. They had the dancers perform three different dances to three different rhythm tracks, regular, moderately syncopated, highly syncopated, and found that all dancers, both trained and untrained, found difficulty in the highly syncopated routine. In terms of applicability to fencing, syncopation is used for different attacks in fencing. The goal is to break the tempo of the opponent which means to place stressed events on weak beats to gain distance on an opponent.

Bouwer, Burgoyne, Odijk, Honing and Grahn (2018) examined different types of accents on different beats, meaning on and off beats within music. Accents are expected to occur on the beat and seem to be missing when accents are on the off-beat. Seeing as syncopation means to displace the beat so that they switch from strong to weak or vice versa, sometimes there are complications in finding the beat if it consistently changes. In this study the authors look at ratings of difficulty from people trying to find the accented beats in different pieces. Overall, different types of accents were processed differently depending on musical expertise. Fencers must create their own beat or rhythm and then be able to place their attacks or accents on unexpected opponents' off-beats to gain distance or place an attack.

Methodological Approach

Given that an investigation into the potential of a fencing and music connection is a lesser-known research topic, I decided to use grounded theory as my chosen methodology using Anselm Strauss' and Barney Glaser's original development of grounded theory (Jones, Brown, & Holloway, 2013). Uwe Flick explains that grounded theory should be used for two main

reasons: first, for an area that does not have much research leaving room for new insights or perspectives, and second, if there is not enough time to do the entirety of a methodology such as a case study or ethnography (2018, p. 12). Creswell and Poth (2018) explain that the point of grounded theory is to use description but to move beyond description to develop or discover a new theory. There have been many studies done with Olympic fencing regarding injuries or muscle imbalances, but very little has been done with music in sport, including fencing.

Within other methodologies, data are normally meant to fit into the constraints of the approach but with grounded theory, the goal is to create new theories or propositions that explain a social phenomenon, leaving minimal restrictions to theory development. (Smith and Sparkes, 2016). “Research questions well suited to the use of GTM focus typically on discovering participants’ patterns of action/interaction with changes in conditions, either internal or external to the process itself” (Smith and Sparkes, 2016, p. 27). For music within fencing, music has the potential to have an internal or external enhancement in performance, specifically regarding footwork, as most fencing bouts are won and lost on footwork. There are many key components to grounded theory, including, a theoretical approach from the start, theoretical sampling, use of the literature, and theoretical saturation.

Using a theoretical approach from the start means thinking theoretically from the start with the goal of developing a grounded theory (Smith and Sparkes, 2016). The initial sampling should be depicted from the research question with the goal, again, of developing a grounded theory (Smith and Sparkes, 2016). For my research question, looking to see if music may help performance in practice or competition with university fencers, within a southern Ontario university, the goal was to develop a theory that could use music as a contributing factor for fencing performance within the university stream with the hope of expanding to more elite or

novice athletes. Also, initial sampling is depicted within my research question as I only engaged with university fencers. Along with having a theoretical approach from the start, theoretical sampling is another key component to grounded theory. Theoretical sampling refers to sampling based on concepts identified during initial data collection and analysis (Smith and Sparkes, 2016, p. 28). This process normally begins with some sampling criteria for the first few interviews then can be modified as needed to adjust the direction of the study.

Grounded theory works best when there are minimal pre-existing theories or literature on the specific topic (Smith and Sparkes, 2016), but the use of literature is beneficial to the research questions. A good, grounded theory approach is rarely deductively produced on existing theories as it could lead to preconceived ideas leading the data analysis rather than letting the data analysis proceed in an organic fashion (Smith and Sparkes, 2016). The use of literature within grounded theory is used to see if there have been any previous theories that have emerged, help develop the research questions, and provide justification for a study (Smith and Sparkes, 2016). For my research, there is minimal research examining the sport of fencing. But considerably more research on how music can help with learning, providing justification for the study. Finally, theoretical saturation, not to be confused with data saturation, means when no new data are being generated. Theoretical saturation refers to when the categories and concepts are fully accounted for and relationships between categories and concepts are explained (Smith and Sparkes, 2016), ultimately reaching a point where continuation of data collection is redundant. One of the goals of my study was to reach a theoretical saturation once data collection and analysis had begun.

Along with these key components of grounded theory, there are also some pitfalls to this methodological approach. One pitfall is only using some grounded theory technique rather than embracing the entirety of the grounded theory process and ultimately mislabeling the study

(Smith and Sparkes, 2016). Another pitfall to grounded theory is that often complex and multidirectional arrow diagrams are used that are often difficult to understand and depict from the literature written (Smith and Sparkes, 2016). Finally, thinking too descriptively can potentially do more harm to one's research as one can spend too much time explaining concepts and categories rather than how the concepts and categories are related (Smith and Sparkes, 2016). It is important to have rich description, but the emphasis must be placed appropriately so one does not become lost in the data or the literature.

Analytic Procedures

Theoretical Perspectives

I believe the philosophical stance most appropriate for my question is social constructivism, which is under the interpretive paradigm. Tracy (2020) describes social constructivism as “both reality and knowledge are constructed and reproduced through communication, interaction and practice” (p. 51). Given my research question, I believe social constructivism is the best way to understand the fencing world in which my potential informants practice, train, and compete to find connections on how music may help or hinder their performance (Creswell, 2018). With social constructivism, I believe in understanding the world around me and relying on my participants and their experiences (Creswell, 2018). Each participant will have a different experience which will add depth to my study.

There are different associated philosophical premises that go along with social constructivism. They include ontological, epistemological, axiological, and methodological beliefs. The methodological beliefs are more of a literary style of writing. Use of an inductive method of emergent ideas is obtained through methods such as interviewing, observing, and

analysis texts” (Creswell, 2018). The methods I used consisted of interviews, observations, and, eventually, analysis and interpretation of my participant’s shared and described experiences.

The ontological beliefs are “multiple realities are constructed through our lived experiences and interactions with others” (Creswell, 2018, p. 35). With fencing being an individual sport, and music having its own perspective from each person who listens, I expected that there would be different realities and perspectives with how the music affects each participant’s performance. I was also interested in seeing if there would be any connections made across participant’s experiences. The epistemological beliefs are “reality is co-constructed between the researcher and the researched and shaped by individual experiences” (Creswell, 2018, p. 35). With epistemological beliefs, the goal is to gain a close relationship to the participants to fully understand their point of view to gain subjective evidence and knowledge (Creswell, 2018, p.21). The axiological beliefs are “individual values are honored and are negotiated among individuals” (Creswell, 2018, p. 35). Since I have interacted with established fencers, the value that fencing has in their lives was an important consideration.

Recruitment and Data Collection

The methods used for data collection included retrospective field notes on observations, and interviews. Prior to any form of recruitment, I gained written permission from the head coach of the varsity team I was working with saying that this project is appropriate, would not interfere with practice or competition scheduling or events, and all participants would be made aware that retrospective observations were being used for the duration of the study during the fall term. I posted a recruitment poster (see Appendix C) within the fencing practice area and spoke to the fencing team both in person and e-mail to gain participants using the letter of invitation (see Appendix B) and the informed consent letter (see Appendix D) to let my participants know

what I am looking for. During the in-person recruitment portion, I let my participants know that I would be making general observations to inform my research that is not focused on individuals, and I would not identify anyone.

Once the informed consent was signed, the retrospective notes on observations consisted of watching my participants, and only my participants, during practice times to see how they interacted with the music in the background during their warmup, during footwork sequences practice, and during fencing bouts. With my insider knowledge from being a current member of the fencing team, I was aware that background music is played for almost every practice, and I did not have to force the team to be listening to music due to it already being played during most practice times. I did not influence the music being played within practice. In addition to being a current member of the fencing team, using retrospective notes on observations did not interfere with practice time or the relationships I have with my teammates and coaching staff as I recorded my observations in a private area once practice had completed. Retrospective notes on observations also occurred at four tournaments to see how each participant interacted with music during the competition day and how it might have influenced fencing performance. Sometimes music is played in the morning of a competition for the venue, but then stops once the competition has begun, but most fencers listen to their own music with their own devices for warm up and in-between bouts. All notes on observations were written retrospectively in my research journal. I only commented on my participants, using general comments to not link specific features to specific people to keep them confidential. I looked for how the fencers used music within the warmup, fencing footwork sections and bouting, whether it be for motivation, cause of distraction, or tempo/rhythm alignment.

Retrospective notes on observations were taken before the interviewing process and continued until the end of the fall term of 2022. The time frame for observations took place once a week during practice time, and at four competitions throughout the duration of the fall term of 2022. Observations were not linked to interviews as they were strictly meant for seeing how the participants engaged with the music and only general comments were made within the research journal.

Interviews began once observations had commenced. Interviews took place online to mitigate Covid-19 risks, but if an interview could not be done online, interviews took place on campus in a quiet space in a library rented room or in an office space available. Audio and video were recorded due to the nature of the interviews taking place online. If an interview took place in person, only audio was recorded. Prior to each interview starting, informed consent was provided, and verbal consent was gained in addition to the previously signed consent form. Interviews with each participant were 45 minutes to a 1 hour in length and were semi-structured with questions prepared and some questions that could be developed within the interview depending on the participant's answers and descriptions. Interviews were recorded for transcription and member checking. Once the transcript was typed, I sent each participant their own transcript to check for accuracy and clarification if needed. Participants had two weeks to return the transcript with corrections or modifications. If the transcript was not returned within two weeks, I assumed the transcript was fine and continued to the next interview. Finally, a research journal was kept throughout the duration of the entire study to record my thoughts and retrospective notes on observations.

Sample Size

The desired number of participants was twelve total university competitive fencers of both genders across all three weapon categories and at least one coach interview. The goal was to have 2 of each gender per weapon category as fencing is separated into male and female divisions. The number of participants gained, were 8 épée fencers (4 female and 4 male), 5 foil fencers (4 female and 1 male), and 4 sabre fencers (2 female and 2 male). Participants were at least 18 years of age, current students at the university, current members of the varsity fencing team, and had varying levels of fencing experience from novice to experienced.

Withdrawal

Participants were made aware both before participating in the study and again before the interview commenced, that they had the right to withdraw from the study if they choose to at any point. If a participant wished to withdraw, they were required to inform myself via e-mail or in person. If a participant wished to withdraw, all data collected were deleted. There were no consequences for participant as participation was voluntary and there was no compensation for any participant. No participants had withdrawn from this study.

Confidentiality and Anonymity

The personal identifiers that were collected include the participant names, initials, and student emails. These personal identifiers were secured within my computer and external hard drive that was password protected for backup in case data may be lost. Once data collection was completed, all personal identifiers were quickly renamed for the remainder of the research process. The people who had access to the data were the principal investigator, Maureen Connolly, and me. The procedures used to ensure confidentiality were done by not using their real names, using quotes in a non-recognizable fashion, and not including the name of university.

At the completion of data collection and analysis, and the final paper, all the data would be stored for 6 months and then disposed of from all saved methods (computer and hard drive). All data collection tools would be erased from the computer's files, recycling bin, and hard drive so they can not be retrieved once the research is complete.

Reflexivity and Positionality

For my reflexivity and positionality, I am an insider to both aspects of my research question. During my undergrad and currently in my graduate program, I am a team member of the varsity fencing team. During my undergrad, I took music as a minor and continue to use my music knowledge within all aspects of my life from school, to work, to family. With this, I was able to build a better rapport with my participants to communicate using insider terminology and basic to moderate understanding of how the sport is played, as I have been a part of the team for over four years; my background in music allowed me to introduce conversations about music into their lives in hopefully a more meaningful way.

I have always felt like the music helps fencing performers without them even knowing that it is contributing, at a subconscious level, which is the study I have conducted. Also, with being a social constructivist, again I relied on my participants and their experiences (Creswell, 2018). Both music and fencing play a big role into my life, and with this I am aware of my own reflexivity and how I needed to keep my personal feelings, aspirations, and preconceived notions behind me during this research process. In the event I found my positionality as a researcher being influenced by my own reflexivity as a fencer, I had an outsider review my findings to limit any unintentional influence I might have had on the trajectory of the study.

Data Analysis

For data analysis, I decided to use the three-phase thematic analysis characteristic of Grounded Theory. Grounded theory analysis and general thematic analysis have relatively the same procedures including open, axial, and selective coding, development of themes, and category development. For thematic analysis, I followed a six-step process outlined by Smith and Sparkes (2016) which overlapped with the open, axial, and selective coding required by Grounded Theory. These six steps consist of familiarization, open, axial, and selective coding, theme development, refinement, naming, and writing up. For phase one, familiarization, I read and reread the transcript while making notes or initial thoughts on relevant insights from the transcript. Familiarization involves engagement within the data, the whole data, but in an informal way (Smith and Sparkes, 2016). It is important not to overlook first intuition, and the little things within the transcript as they could be important and give the researcher a starting and a reference point if the data became overwhelming. Phase two was, open, axial, and selective coding. Open coding involves going line by line and/ or by sentence to discern fulsome meaning within the line or sentence being read. This practical and essential step toward theme development can include as many codes as needed to support the research question. Axial coding uses the codes developed within the open coding phase and makes connections to each other as if on an X and Y axis. Taking the more emergent or reoccurring codes to create categories, or the codes closest to the axis centre then leads into selective coding. This could be three to five general codes to summarize all axial clusters developed from the open coding. Selective coding involved developing thematic statements about each axial cluster. Out of the collective codes made within the axial clustering, statements were then made to portray or present each cluster.

Once all coding had been completed, phase three, theme development occurred. Theme development is about taking your thematic statements made throughout selective coding, to develop themes for description throughout the rest of your data analysis, identifying higher level patterns or rich diversity of themes rather than just one code (Smith and Sparkes, 2016). The refinement stage, or phase four, involves reviewing all data analysed. It was always beneficial to review my original notes from my first read of the transcript to ensure that I had included all aspects that stood out to me originally within the transcript. Phase five then occurs with naming themes. When naming themes, it can be prosaic or creative depending on the research question and or the nature of the study (Smith and Sparkes, 2016). Once one transcript was finished, I moved on to the next, continuing this pattern of thematic analysis until all transcripts were finished. Finally, I moved to phase six, writing up the rest of the findings and final thoughts that were made apparent through the data analysis.

Findings and Discussion

Research Questions

The research question previously stated was what is the influence of music on performance in practice and competition among university competitive fencers? Along with this question I was also interested in learning about how tempo and timing might be influenced by music. These questions were answered along with other findings that I discerned from the data analysis.

Theoretical Propositions

There were a total of 9 theoretical propositions that were developed from this research. They were split into 2 categories: Practice and Competition. The practice section contains 6 theoretical propositions speaking to the research questions: how one uses music in practice (three uses), how one learns, how every weapon is different, and how bouting is important within a practice

section. The competition section contains 3 theoretical propositions speaking to the research questions: how one uses music within a competition setting, how one learns, and how adapting to changing situations is vital.

Timing, Tempo, and Rhythm in Two Worlds

Before speaking to these theoretical propositions, it is important to explain the differences between timing, tempo, and rhythm in a music lens and in a fencing lens as the participants have their own understanding of what each element is. These clarifications of fencing timing, tempo, and rhythm were obtained from the ‘Coach’ during their interview. Timing, in music, is the ability to keep accurately to the beat and play/sing the notes at the correct time. Music timing consists of two different kinds of timing, absolute timing, meaning as it appears on a stopwatch (Tan, Pfordresher, and Harré, 2018), and relative time, meaning the relationship between a time interval and its surrounding context, (Tan, Pfordresher, and Harré, 2018). (i.e., terms such as dotted quarter note, eighth note and half note use relative time). Timing, in fencing, was referred to as two things: one, the skill or action of determining the right moment in a situation to attack or defend; and two, the amount of time to do one simple action (i.e., fencing time). The biggest difference between the music timing and the fencing or movement timing is that timing within music is mostly regulated, and you can see it on the page, whereas in fencing it needs to be searched for. ‘Coach’ explained that “openings or opportunities in fencing do not remain open long and need to be capitalized on the moment they are seen”. Coach also emphasized “knowing when to go and when not to go”. If a fencer is unable to see the openings or can see the openings but does not take advantage of these openings or is unaware of how long a fencing action takes, timing will take a long time to develop. Timing within music can also be played with by doing a subtle adjustment of a note or tempo change but still needs to fit within the confines of the

music. Tempo, in music, is the speed at which a piece is played or beats per second (BPS).

Tempo, in fencing, is the speed of how one changes attacks or defences. Tempo changes in music and fencing are closely related as tempo changes can be gradual or can be sudden. 'Coach' explained that tempo changes in fencing are what cause the element of surprise, even at a gradual pace. Music tempo can be altered with articulations written on the sheet music or can be adjusted if the performer wants to adjust it, but it still needs to fit within the confines of the music itself and the BPS that has been provided. Fencing tempo can be altered with the speed or different footwork and bladework used without any restrictions other than maybe someone's physical limitations. This study did not look at BPS while speaking to tempo in fencing as the participants and coach were referring to fencing tempo during the data collection process.

Rhythm, in music, is the pattern of regular or irregular pulses caused by the occurrence of strong and weak beats. Rhythm, in fencing, is described as the flowing and stopping of both opponents while keeping distance. 'Coach' describes fencing rhythm as a portrayal of a fencer's confidence, meaning if they can keep distance and also control the pace of the bout, then they have a good sense of rhythm. For example, if a fencer takes a step forward, normally the opposing fencer would take a step back. This continuation of keeping distance without being too far from your opponent that you cannot hit them or being too close that you just get hit is a crucial aspect of a fencer's rhythm. The pattern of regular and irregular pulses within music rhythm and the flowing and stopping of fencing rhythm have similarities, but fencing rhythm is more sporadic and follows minimal patterning while still allowing the fencer to stay in control of the bout.

Timing	Tempo	Rhythm
<p><u>Music Timing</u></p> <ul style="list-style-type: none"> - The ability to keep accurately to the beat and play/sing the notes at the correct time - Absolute and relative timing 	<p><u>Music Tempo</u></p> <ul style="list-style-type: none"> - The speed at which a piece is played or beats per second (BPS) 	<p><u>Music Rhythm</u></p> <ul style="list-style-type: none"> - The pattern of regular or irregular pulses caused by the occurrence of strong and weak beats
<p><u>Fencing Timing</u></p> <ul style="list-style-type: none"> - The skill or action of determining the right movement in a situation to attack or defend - The amount of time to do a simple action 	<p><u>Fencing Tempo</u></p> <ul style="list-style-type: none"> - The speed of how one changes attacks or defences 	<p><u>Fencing Rhythm</u></p> <ul style="list-style-type: none"> - The flowing and stopping of both opponents while keeping distance

Table 1: Timing Tempo and Rhythm Comparison

Practice Theoretical Propositions

1) No Cookie Cutting in Fencing: Rhythm is Free to Develop

Although each weapon has corresponding footwork and bladework, they each have their own style, sense of rhythm, and music influence on performance. It is important to think of all the weapons in fencing, *épée*, foil, and sabre, as their own sport. ‘Coach’ describes how each weapon has their own personality and can help people decide as to which weapon is best for them. *Épée* fencers are more conservative due to the mental game being played between your opponents. There could be nothing happening during a bout as both fencers get a feel for their opponents, everything flows nicely, then there might a sudden burst of energy strategically placed to attack, then back to planning. This is also why *épée* is considered the slowest of all fencing styles. Foil fencers often show more finesse while fencing due to how they use the blade. Foil fencers also follow a more structured sequence, allowing for more back and forth attacks as the priority rule naturally switches between fencers. Sabre fencers often show more

confidence due to the speed of the sport and how they can use the entire blade. Sabre fencers are often interested in high energy attacks, exciting build up to these attacks, and satisfying sounds from both landed attacks and parried attacks. This is not to suggest that these are the only personalities that exist for each weapon, but these are the most prominent. They are all distinct from each other and each style of fencing can be determined based on each person who tries. Foil 1 participant states that “there is no cookie cutting in fencing as everyone is unique”. The footwork and bladework has a basic mold to fit into for what is correct, but this is adjusted to meet the needs of each fencer. ‘Coach’ states that fencing is for everyone and can be personalized for each person. ‘Coach’ continues to explain that many fencers are neurodiverse learners meaning they think and process in different ways. ‘Coach’ recommends that having multiple styles of teaching is beneficial to those who require or benefit from multiple ways of learning. These coaching styles could include one or a combination of all kinds of instruction. Verbal, describing the actions using correct terminology; visual, having a proficient fencer demonstrate how the actions should look; and auditory, how the footwork or bladework should sound. Instructions are often used by the coach within a practice setting. ‘Coach’ often does a combination of these kinds of instruction to accommodate the fencers’ different but preferred learning styles. There are often many people within a fencing practice and the ability to showcase multiple ways of learning aids in the progressions of multiple fencers. If a fencer needs more precise or individualized instruction, then the coach or an assistant coach helps the fencer, or an individual lesson would be given to help accommodate the needs of the learner. If fencers are in group work, such as the ‘group footwork section’ of practice, then group-based instruction would unfold, or, if necessary, individualized instruction within the group-based context.

The sense of rhythm within each weapon comes from the fencers themselves. While learning fencing as a novice, the fencing rhythm is often stiff and robotic as they are learning the movements, but once they become comfortable with the movements, they then develop their own sense of rhythm. Epée 1 participant states, “his coaches never said you should fence this way” and “that is what I like about fencing as it can be developed to fit your needs and likes”. It does take time for rhythm to be developed and even longer for one to find a rhythm pattern that works for them against their opponents. Different rhythm patterns that fencers can use include, slow, smooth, quick, and bouncy to name a few. Epée 3 participant says, “rhythm comes with lots of practice and continuous work”. It is up to the fencer to discover their own fencing rhythm and adjust when certain rhythms are not working for them.

Most of the participants stated that they had used music to learn how to fence their specific style and gain their sense of rhythm. Most participants just listened to the music at practice and followed the rhythm or beat of the song. This was just a starting point for them as they are aware that having a regular rhythm made them susceptible to being hit easier from tempo changes. They would use the music to discover the rhythm pattern they wanted to use, and then adjust to each fencer to remain unpredictable. Foil 1 participant shared that “music can set the tone for your internal rhythm but can also confuse your fencing if the wrong songs are being played”. With fencing being unique to each person, the music being played has an influence on how one may move or perform. Sabre 1 participant discussed how “music, like art, is up to interpretation of the listener, and how one person’s sound is another person’s noise”. It is hard to have music dedicated to everyone in the practice setting as each person has their own needs, sense of rhythm and style.

2) Emotional Component to Music Influence

Music played at practice can influence their moods and emotions. Specifically, music plays a big influence on motivation while warming up, practicing footwork, and bouting in practice. While interviewing the coach, they stated that music energy input equals fencing output, when used correctly. From my observations, I noticed that the épée participants were influenced more by the music being played as I could see their movements were matching the energy level of the song. This means that if a fast song was playing, the energy level of the bouting was high, fast paced, and energetic and vice versa if a slow song was being played. With my sample pool being based within a university setting and with practices often held in the evenings, the participants were sometimes tired or drained from the school day or sometimes were fully energetic and ready to expel some energy. On the days when some fencers were feeling slow while they were fencing, many would take some time to listen to the fast-paced music to improve on their tired mood and it would help them move faster. On the other hand, if the fencers were feeling overwhelmed or overstimulated/frustrated, they would listen to slower music to help them calm down and get their actions back under control. From my observations, the fencers would listen to their desired music through personal listening devices as there was other music often being played over the speakers for many of the practices. They would take some time to get refocused and then rejoin the bouting. This would only happen during the open bouting portion of practice not during footwork or bladework and only in between their bouting sessions. Some fencers would also keep songs or beats in their heads, to help with the internal rhythm. Épée 2 participant listened to music in their head and changed the song if it didn't fit the pace of the bout of who they were fencing. They mentally used music to change their fencing rhythm to adjust to their opponent's fencing style to overcome their attacks. Mentally playing

music in a fencer's head could help set the mental rhythm and also keep their moods/energy level matching the fencing bouts.

3) Music is helpful and harmful

As much as music is a help for motivation, it can sometimes be a distraction and can lead to possible overstimulation. The songs that are well known seem to make the fencers get off topic from practice and become more social but still enjoy practice. When asked during the interviews, what are your cons of having music in the background, the majority stated that the music could be distracting at some points during practice for various reasons. Foil 4 participant explained that “music keeps people’s attention but sometimes took away from the task at hand”. From my observations during the footwork section, I would often see my participants dancing to the beat of the music or mouthing the words to the song being played while receiving instructions. While bouting during practice, there were moments where people would be dancing on strip while fencing or singing all together while waiting to get on piste. It was visually apparent that having music on during practice did lead to some practice distractions. Another observation was sometimes if there was a song that did not fit the ‘tone’ of practice the coach would go and change the song. There are many styles of music that could be deemed satisfactory for a fencing practice but if the music was slow during a high intensity activity, or fast during a cool down activity then the music would be contradicting the activity. The idea is to match the speed of the activity to the music being played or entrainment, meaning a process where one rhythmic pattern achieves and maintains synchrony with another pattern or activity (Tan, Pfordresher, and Harré, 2018). Neutral entrainment is likely linked to our physical response to musical rhythms and having incorrect music for specific activities will affect this physical response and may lead to not gaining the full involvement of the activity (Tan, Pfordresher, and

Harré, 2018). For this fencing team, a team playlist was created with recommendations of different songs taken from all team members. The playlist was diverse in its song selections and was normally placed on shuffle at the start of practice and would continue throughout the duration of practice.

There are often one-on-one lessons offered during practice time and some of the participants enjoyed the music in the background like Epée 6 Participant who would take lessons and still listen or focus on the music as it recentered their focus. On the other hand, Foil 3 participant shared that “sometimes while the music is playing, and they are trying to learn a new skill, they feel overwhelmed with the background noise”. The external focus of attention within fencing only has a certain capacity and music can sometimes make fencers reach their limit to both stimulation and information processing. Many participants said that music in the background could lead to implications while doing footwork as they sometimes couldn’t hear what the coach was directing. Many participants said that they prefer verbal and visual instruction paired and the music sometimes inhibited this learning strategy. Epée 5 and Sabre 3 participants revealed that they have a hard time hearing and have a difficult time learning with only visual demonstrations. If the music is too loud, and the demonstrator is on the other side of the room, they have a hard time processing the skill that is needed to be performed. Epée 1 participant mentioned that it might be beneficial to have the music not played for 20% of the practices to recreate the fencing tournament environment to get used to the sound of just fencing footwork noise. Furthermore, many participants said that they prefer to have music playing rather than empty noise. Practice is meant to prepare those for tournament-based scenarios and having the music off for some of the practices may be beneficial for transferable skills for competition day. Although, in actuality, fencing tournaments are very loud and this can be

distracting while fencing in the competitive setting. Many fencers have stated that the music is distracting, so having the music playing can provide them an opportunity to block out the unnecessary noise as one would need to do in a fencing tournament to prevent them from becoming over stimulated.

4) Learning in Parts and Wholes

Learning fencing in parts, footwork and bladework separately, and then practicing as a whole is beneficial to the learner to fully understand the specific movements. Fontana et al. (2009) explain that the part method practice should be used for high in complexity and low in organization tasks, and whole method practice should be used in low complexity and high in organization tasks. Fencing would be considered high in complexity of the movements as the execution of one step influences the next one, and high in organization as the execution of one skill without including the one part of the movement will affect how the movement will feel (Fontana et al, 2009). Moradi et al. (2023) also explain how instructors or coaches need to choose whether a skill needs to be learned in part or whole. Again, this is based on the skill's complexity and organization levels. Moradi et al. (2023) continues with the end goal being to combine practice parts to gain whole skills. Using part and whole practice while learning in fencing is crucial for learning skills and can be up to the coach and the learner as to how far tasks can be broken down into parts or kept as wholes. Often footwork and bladework are done separately but if these need to be broken down further this can be done based on learners' needs. During the interviews, I asked everyone to describe a typical practice for them. Most participants said practice was as follows: warm up/self directed footwork, group footwork, weapon specific bladework, and guided/freeform bouts. The coach had ensured that each practice was structured this way as most fencers appreciate structure and knowing what is to come. Also,

practice is organized based on how one should learn in fencing; moving from doing footwork separate from bladework, bladework separate from footwork, and then a combination of both, i.e., moving from simple to complex. Moving from simple to complex or single to combination actions takes up one's focus of attention rather quickly and would be considered moving from part to whole practice.

Internal focus for a fencer is looking at how the action is developed throughout the entire body and being able to perform the attacks while coordinating between hand and foot cooperation. 'Coach' states that "alternating hand and foot cooperation is difficult to learn, and to learn well." It takes a great deal of time to learn how to adjust the hand to the foot rhythm and foot to the hand rhythm. This means that different speeds of bladework are used for different actions and the footwork movements make up for those over or underestimations of the attack. This is why it is so important to get one's arm out first as one attacks since one judges the distance between oneself and one's opponent by the blades and not the bodies. 'Coach' mentioned that managing two things at once is the hallmark of a great fencer. The ability to multitask while fencing is extremely important as there are many things to be thinking about while fencing. Internal focus could potentially help with facilitating the ability to multitask as the hands and feet have a similar end goal of closing the distance. Sanbonmatsu et al. (2013) speak about how executive attention is the central to multitasking because the information and goals are relevant to one task must be actively maintained while other tasks are being performed. Seeing as internal focus of attention is where the performer's attention is directed at the action itself (Wulf et al. 2001), the fencer needs to be actively thinking about both hands and feet separately to accurately close the distance between themselves and their opponent thus

multitasking along with using their external focus of the outcome of the action and being able to recover if the action had failed to land as intended.

Learning the attacks, parries, and other aspects of fencing are essential skills to learn but are rendered useless unless the fencer can develop the sense of timing and use tempo changes effectively. Practicing the basics in footwork and bladework are important to develop the automaticity of how it feels so they do not need to dedicate their sole focus on these basics. Epée 1 Participant explains that learning timing came from practicing footwork, so they did not need to focus on it while they were fencing. If they know the basics, then they can turn their focus to more complex aspects of the sport. Keeping this in mind, the basics do not change as they progress through more complex actions. Epée 2 participant shares that if you are constantly changing the size of your actions or footwork size to alter your timing, you will not be successful. Changing the size of your footwork does not improve your sense of timing. Foil 2 participant also shares that changing the size of your steps is not considered a tempo change and to execute a tempo change well, one needs to be physically fit and have a great deal of leg strength. These footwork size changes are common misconceptions about how tempo and timing work for novice fencers. Timing and tempo changes are most effective if you keep the size of your footwork the same but change the speed or vary the patterns of footwork. This means using steps, double steps, or half steps to alter the timing and/ or tempo of the attack.

There is a common phrase that is said in fencing, that is 'start slow and finish fast'. While learning in one-on-one lessons in fencing, you would learn the action or action progression slowly and then progress to a faster pace. You could develop by performing the action progression all at one speed or adapt to starting slow and finishing fast. During the interviews, the participants said that the easiest part of tempo changes was moving from slow to fast as this

had been practiced often. The hardest part of tempo changes was moving from fast to slow for various reasons. Epée 3 participant stated that moving from fast to slow was difficult due to the adrenaline of continuously moving faster but then suddenly needing to stop and move backwards if the attack missed. Sabre 3 participant explained that it was difficult for them to change their momentum from forward to backward quickly due to them fully committing to the action. From my observations, it was apparent that while bouting, moving from fast to slow was not easy for the participants, especially if they needed to recover from a failed attack. Tempo changes and timing comes along with knowledge of the sport, being able to read your opponent on when to go and when not to go, and disassociation of the hand and foot to capitalize on all openings from your opponents. From the interviews, it was made apparent that rhythm and tempo changes are a physical feeling and timing is an internal feeling. Both novice and experienced fencers explained that there was a difference between rhythm and tempo changes in comparison to timing. The difference between the physical feeling and the internal feeling from the participants was that they could feel the movements while deciding the desired rhythm and making tempo changes and when it came to timing, it was knowing when to go and when not to go and seeing the openings and making the decision on whether to make the desired physical action to attack. Ultimately it involved making a cognitive decision and then using rhythm and tempo changes to accommodate the decision made.

5) Auditory Cues and Movement Automaticity

Footwork and music while practicing seem to be a beneficial way of learning as one can link auditory cues if the music matches the footwork being practiced. It may be beneficial to have a specific playlist while doing group footwork at practice to help with this auditory sensory way of learning. Many participants link fencing footwork to auditory sounds. ‘Coach’ will

sometimes show footwork and say sounds for people to hear what the footwork pattern should sound like. For example, if the pattern is an advance lunge, the auditory sound would be ‘ta ti ti’ or “baa baba” as the coach would say. If it was notated, it would look something like this:



Figure 1 Advance Lunge Notation

From my observations and interviews, there were some participants who would link syllables from words to fencing footwork patterns for learning tempo changes. The words ‘Margarita’ and ‘Pina Colada’ were used often during group footwork to show variations of the advance lunge and tempo changes. The enunciation of the words would change depending on how they would like the footwork progression performed. For example, the footwork pattern for ‘Margarita’ could be step, half step, lunge, or ‘ta ti ti ta’ or as the coach would say “baa ba da ba”. Another example would be for ‘Pina Colada’ where the footwork pattern could be step, advance, lunge or ‘ta ta ti ti ta’ or as the coach would say “baa baa ba da ba”. If these were notated, they would look like this:



Figure 2 Margarita Notation



Figure 3 Pina Colada Notation

‘Coach’ believes that the fencers know if the action is correct based on how it sounds. This is for both footwork and bladework. Epée 3 and Sabre 3 participants say they use sounds or auditory cues to give details for movements when helping other fencers or explain to the coach what they had done. If the fencers hear the action and perform it correctly, they can link a

physical feeling to an auditory cue. This would be a form of reassurance that they did the action correctly. Sabre 4 participant decides their rhythm from what they hear on the floor from their opponent's footwork. Based off their footwork sound, they can link the correct movement to overcome an opponent's attack, i.e., linking a sound to a physical action.

Within fencing, there is specific movement/footwork used to distract your opponent with a sound called an appel. An appel is stomping of the front foot on the ground to make a sound to distract or startle your opponent, linking a auditory cue to a undetermined action. This distraction can lead the opponent to become weary of what may happen next and make them feel unprepared of the next move. An appel, is like an accent in music where the accented note is different from the rest, making this note louder, softer, or longer (Tan, Pfordresher, and Harré, 2018). Movements within fencing already use auditory cues linked to physical feelings to throw off opponents but music could help link a fencers timing to match auditory cues. Auditory sounds and physical feelings can be linked through music according to Epée 5 Participant as they learned their timing from how footwork sounds from the coach explaining it and connecting that to beats in songs or vocal runs from artists in songs. They appreciate when both sounds, verbal or footwork sounds, are used in practice as they can link them to songs they enjoy and practice the footwork while listening to the music and know that they are doing the footwork correctly based off this sound.

6) Practice Bouting is Meant for Practicing

Bouting in practice is more repetitive than bouting in competition as the fencers are often trying to work on something. There is the luxury of working with a partner and asking them to do the same attack again to work on their response to the attack. It is easy to manipulate partner rhythm while in practice if someone would benefit from a slower or faster tempo while learning.

There is normally music playing in the background at practice, but it was hard to observe or notice if the fencers were using the music to help with bouting as the attacks and/ or defences were when the fencers could see openings. Epée 1 and Epée 3 Participants often do guided bouts meaning they have one fencer who is the attacking fencer only and one is the defensive fencer only. They each work on their own skills and then switch so each partner has chance to do both aspects.

Bouting in practice also contains less pressure than bouting in competition due to minimal repercussions if you get something wrong. There is sometimes a problem with bouting in practice as some fencers do not look at it as 'practice' but as wanting to win each bout. Rather than the fencers working on something they are not the best at, they continuously work on what they are good at. This can lead to minimal growth in the fencer's arsenal of attacks and defences. In my observations, I have noticed that many of the participants would consistently work on the things they know because they are easy and got frustrated working on things that did not come easy. Foil 2 Participant talked about how the most boring and repetitive tasks are the most important for learning in fencing. It takes a long time to learn skills and do them well. It is best for fencers to continuously work on skills to improve them but not only work on the ones that are already great, unless the opposing fencer wants to work on those skills with them.

Competition Theoretical Propositions

1) Music Influence within Competition is Minimal

Bouting within competition does not have much musical influence and only plays a small part in pre-competition preparation and can possibly help in between bouts throughout the competition day. Music is prohibited from being played during competition bouts but is sometimes played over sound systems before competitions are beginning, as people are walking

into the venue. Many fencers use music to warm up, while listening to their own personal devices. Epée 5 participant mentioned that music helps them get into the right head space while fencing and helps them remain calm and keep nerves down in between bouts as sometimes they feel overwhelmed.

Some fencers do not use music at all because they are afraid that they might miss something important or get distracted from the competition. Sabre 1 participant says they do not listen to music because they prefer to mingle with the team, get information on who may be competing that day, and get tips on how to progress throughout the day. Some participants prefer to immerse themselves into the competition setting to get used to the sounds and environment. Foil 2 participant thinks that the music dissociates you from your environment. It is important to them to be placed into the environment as it helps with focus on the day. Overall, the music influence is minimal as compared to the practice sessions.

2) External stressors, Unintentional Errors, and Competition Pressures

When fencing within a competition, due to external stressors or competition pressures, sometimes fencers tend not to be aware of what their bodies are doing. They could mentally know what action is beneficial for them in that moment but sometimes perform the action incorrectly due to trying to do the action too quickly or too big or being too close or too far away. Boutings in competition is the most beneficial way for growth in technique and skill as well as rhythm, tempo, and timing. ‘Coach’ spoke about how the true sense of timing can only be found in actual boutings within a competition as it is difficult to manipulate partner rhythm, whereas in practice it is easy to do so. The sense of timing takes a long time to learn and is often needed to be self-discovered and not necessarily shown, as timing is more of an internal feeling. Foil 1 Participant said, “if timing and distance were perfect, there would be no need to continue

fencing, it is not about getting faster or stronger but having a challenge”. Within competitions, challenges always become apparent as no competition is the same. Foil 1 Participant continues about how timing is difficult, and rhythm is different for every opponent as the height and speeds change and constant adjustments need to be made. Due to these constant changes, it makes sense that external stressors can affect the fencer and make them not aware of their own body and their actions. ‘Coach’ talks about how physical actions rely on perception; one can see the action as a big action, but the fencer could feel it as a small action. Fencers need to be aware of their own bodies and their actions and sometimes competition pressures can lead to mistakes.

Unintentional errors are common within competition, especially with the novice fencers, but also with experienced fencers as every competition is different. From my observations, fencers get overstimulated from all the new sounds and sights as there is a lot going on within a fencing competition. ‘Coach’ states that fencing tournaments are very loud, can lead to overstimulation, and your ability to block out all unnecessary sounds is challenging but important. During the interviews, I asked, “what do you hear while fencing?” and I had many responsees say they hear the common things such as, the scoring boxes, the referees, the cheering, and the coaches. Some responses included people saying they can hear everything, and some said they could hear nothing. Those who could hear everything are worried about missing information or worried about what might be going on the strips beside them. These fencers need to adjust their hearing to help with their focus of attention as it will take away from fencing aspects that might require more attention. Some other responses from the experienced fencers included hearing the blade contact and the footwork sounds on the strip. For fencers within competition, it is important to filter the sounds heard and use them for their advantage.

3) Partner Rhythm / Opponent vs Opponent

While fencing within a competition, it is important to set the pace and rhythm, or recognise when you are following your opponent's pace to be able to change to your preferred pace. Setting the rhythm pace in a competition is important to ensure you do not get entrapped or entrained, in your opponent's action set up. Most experienced fencers can spot when someone is following their footwork and can capitalize on this error. Normally, as explained earlier, if a fencer takes a step forward then the opposing fencer would take a step back to maintain distance, but it is important not to simply copy your opponent's movements but maintain distance varying the footwork until the fencer is ready to attack. There are times when fencers will follow their opponent's pace, normally within the priority weapons, foil and sabre, and also if a fencer has a defensive style, they will tend to wait for their opponent to attack and parry their attack followed by an immediate riposte.

Epée 3 participant says that they do not try and follow their opponent's rhythm but instead try to match their energy levels. They try to understand what their opponent is doing and disrupt their actions. For example, if the fencer is fencing with lots of bladework action, i.e., keeping constant blade contact, the opposing fencer needs to try and keep the blade away from their opponent so they cannot hold it into a bind and be pushed out of the way during an attack. It is very difficult to make the opposing fencer follow your footwork as everyone has their own desired pace and is trying not to follow their opponent's footwork. Epée 2 participant talked about how getting points in fencing is not always easy. They state, "just because you got the point does not mean that it was easy". It takes a great deal of effort, precise movements, and patience to earn points in fencing and within a competition each point is important. Partner

rhythm is difficult to manipulate as both fencers have their own desired plan of action to overcome each other.

To summarize, the theoretical propositions generated from the data were split into practice and competition settings. Within the practice settings, I discovered that fencing is made for everyone of all body types, varying abilities, and certain aspects such as rhythm, are free to be developed from the athlete. There are emotional components to music influence while music is played at practice. Mostly motivation and energy levels were matched to what was being played and music could alter how one was feeling that day to enhance the fencing practice that day. As much as the music was enjoyed by most participants and filled the ‘empty air’, many also felt the music as a distraction from learning. If the music was popular or even too loud it led the fencers to have difficulty focusing or even hearing the instructions needed to do the task making music both helpful and harmful to the listeners. Learning in parts and wholes was beneficial to the learners as many of the skills were difficult to learn all at once. The importance of dissociation of hand and foot movements in fencing is a difficult skill to learn. Further, learning rhythm, tempo and timing comes with a lot of practice. Auditory cues and movement automaticity was a good bridge between physical movements and understanding tempo changes. The use of a rhythm syllable system while doing footwork helped show athletes how to do tempo changes correctly and help understand the feel of correct movements. Finally, bouts in practice is meant for practice and growth and these are best achieved by not only working on what is already good.

For the competition settings, the music influence played a part only in pre-competition preparation and some motivation in between bouts as music is prohibited from being listened to while fencing. External stressors, unintentional errors and competition pressures are common for

both novice and experienced fencers. There are a lot of stresses placed on fencers within competition settings, whether that be self inflicted or from spectators. Fencers can make mistakes and not be aware of what mistakes are being made or be overstimulated from all the sounds of a competition. Finally, partner rhythm is difficult to manipulate. It is an endless battle of recognition of following or being followed for the desired rhythm of the bout. Fencers need to remain in control of the bout if they want to overcome their opponent.

Limitations

The first limitation for this study was that it was limited to one fencing club at one university. Although the participant pool was sufficient for grounded theory, most of the participants only participated at this one club and are only aware of how practice and competitions are run within the one university. There could have been different perspectives within different university fencing clubs that were not explored. The second limitation was that within the study most participants were novice fencers. Many of the participants were between 1-3 months of experience up to 3-4 years of experience. Only 6 out of the 15 participants had experience fencing for more than 8 years and some upwards of 13-14 years experience. Having both experienced and novice fencers did not devalue the answers given but the experienced fencers were able to provide more detail as to why they moved or responded the way they did. This ratio could have been more balanced; however, having both experienced and novice fencers' viewpoints was important for diversity in the study. The third limitation of the study was that it was my first time doing grounded theory. Within grounded theory, there is no standard set of rules for identification of themes or theme development and there was a plethora of data and levels of analysis that sometimes I found difficult to manage. There could have been some potential themes that I had missed or focused more on one specific theme over others. There was

a lot of trial and error as there usually is when doing something for the first time. Now that I have done a grounded theory study, I am aware of how to improve on my skills and tactics when tackling this form of research again.

Future Directions

Future research within this realm of study would be beneficial to understand more deeply the music connection with fencing. One direction that could help this research could be to interview more than one coach, either within a single fencing club, as some fencing clubs have assistant coaches or weapon specific coaches, or head coaches across different clubs. It would be interesting to learn more from other coaches because every coach has their own approach to coaching and ideas around music. Another direction that could be advantageous would be to interview more experienced fencers within the university stream, who have 10 or more years experience within the fencing world. Experienced fencers have a warmup, footwork, bladework, and partner work established already, and it would be interesting to see if music had an influence in developing these habits.

Conclusion

In conclusion, music and fencing may seem like very distant topics but music has the potential to play an important role in fencing if fencers choose to use music to help build their skills. This depends on the athlete, coaching style, and how one learns. From the literature, rhythm, timing, and tempo and development of these aspects are important factors in fencing as there is a small window to score successfully, and the development of these aspects are difficult to build. With music terms being intertwined with fencing, music and fencing go hand in hand in development of skills and the application of skills in bouts. The influence of music on performance in practice and competition is up to the listener and how they choose to use it in

their fencing. Rhythm, timing, and tempo are free to be discovered and music can help in finding patterns, developing an internal sense of timing, and understanding tempo changes in fencing.

References

- Barth, B., & Beck, E. (Eds.). (2007). *The complete guide to fencing*. Meyer & Meyer Verlag.
- Bouwer, F. L., Burgoyne, J. A., Odijk, D., Honing, H., & Grahn, J. A. (2018). What makes a rhythm complex? The influence of musical training and accent type on beat perception. *PLoS One*, *13*(1), e0190322.
- Borysiuk, Z., & Waskiewicz, Z. (2008). Information processes, stimulation, and perceptual training in fencing. *Journal of Human Kinetics*, *19*(1), 63-82.
- Brett Smith, & Andrew C. Sparkes. (2016). *Routledge Handbook of Qualitative Research in Sport and Exercise*. Taylor and Francis. <https://doi.org/10.4324/9781315762012>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative Inquiry & Research Design: Choosing among Five approaches* (4). SAGE.
- Czajkowski, Z. (2009). Tactics in Fencing – Preparatory Actions. *Studies in Physical Culture & Tourism*, *16*(4).
- Czajkowski, Z. (2011). Sensory-motor Responses in Fencing. *Studies in Physical Culture & Tourism*, *18*(2).
- Dalby. (2005). Toward an Effective Pedagogy for Teaching Rhythm: Gordon and Beyond. *Music Educators Journal*, *92*(1), 54–60. <https://doi.org/10.2307/3400228>
- Fontana, F. E., Furtado, O., Mazzardo, O., & Gallagher, J. D. (2009). Whole and Part Practice: A Meta-Analysis. *Perceptual and Motor Skills*, *109*(2), 517–530. <https://doi.org/10.2466/pms.109.2.517-530>

- Hallam, S. (2010). The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education*, 28(3), 269–289. <https://doi.org/10.1177/0255761410370658>
- Hu, X., Chen, J., & Wang, Y. (2021). University students' use of music for learning and well-being: A qualitative study and design implications. *Information Processing & Management*, 58(1), 1–. <https://doi.org/10.1016/j.ipm.2020.102409>
- Karageorghis, C. I., Lyne, L. P., Bigliassi, M., & Vuust, P. (2019). Effects of auditory rhythm on movement accuracy in dance performance. *Human movement science*, 67, 102511.
- Kim, T., Kil, S., Chung, J., Moon, J., & Oh, E. (2015). Effects of specific muscle imbalance improvement training on the balance ability in elite fencers. *Journal of Physical Therapy Science*, 27(5), 1589–1592. <https://doi.org/10.1589/jpts.27.1589>
- Milic, M., Janicijevic, D., Nedeljkovic, A., Cuk, I., Mudric, M., & García-Ramos, A. (2020). Optimal Instructions to Maximize Attack Efficiency in Beginners and Experienced Fencers. *Motor Control*, 25(2), 153-166.
- Misuraca, R., Miceli, S., & Teuscher, U. (2017). Three Effective Ways to Nurture Our Brain: Physical Activity, Healthy Nutrition, and Music. A Review. *European Psychologist*, 22(2), 101–120. <https://doi.org/10.1027/1016-9040/a000284>
- Moradi, J., Maleki, M., & Moradi, H. (2023). The Effect of Part and Whole Practice on Learning Lay-Up Shot Skill in Young and Adolescent Male Students. *Journal of Motor Learning and Development*, 11(1), 143–153. <https://doi.org/10.1123/jmld.2022-0033>

- Sanbonmatsu, D. M., Strayer, D. L., Medeiros-Ward, N., & Watson, J. M. (2013). Who Multi-
Tasks and Why? Multi-Tasking Ability, Perceived Multi-Tasking Ability, Impulsivity,
and Sensation Seeking. *PloS One*, 8(1), e54402–e54402.
<https://doi.org/10.1371/journal.pone.0054402>
- Shaw. (2008). Fencing instruction for children. *Strategies (Reston, Va.)*, 22(2), 81–120.
- Tan, Pfordresher, P., & Harré, R. (2018). Perception of musical time. In *Psychology of
Music* (2nd ed., pp. 91–104). Routledge. <https://doi.org/10.4324/9781315648026-6>
- Thompson, K., Chang, G., Alaia, M., Jazrawi, L., & Gonzalez-Lomas, G. (2021). Lower
extremity injuries in U.S. national fencing team members and U.S. fencing
Olympians. *The Physician and Sportsmedicine*, 1–6. Smith, B., & Sparkes, A. C.
(2016). *Routledge handbook of qualitative research in sport and exercise*. London:
Routledge. <https://doi.org/10.1080/00913847.2021.1895693>
- Tracy, S. J. (2020). *Qualitative research methods: collecting evidence, crafting analysis,
communicating impact* (2). Wiley
- Wang, L. (2010). Relative timing and rhythm: a key to motor skill learning. *The Shield-Research
Journal of Physical Education & Sports Science.*, 5.

Appendix A



Brock University
Office of Research Ethics
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Health Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE: 9/13/2022

PRINCIPAL INVESTIGATOR: CONNOLLY, Maureen - Kinesiology

FILE: 22-004 - CONNOLLY

TYPE: Masters Thesis/Project STUDENT: Tamara Tait
SUPERVISOR: Maureen Connolly

TITLE: What is the influence of music on performance in practice and competition among university age competitive fencers?

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW

Expiry Date: 9/1/2023

The Brock University Health Science Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from **9/13/2022** to **9/1/2023**.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 9/1/2023. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Office of Research Ethics web page at <https://brocku.ca/research-at-brock/office-of-research-services/research-ethics-office/#application-forms>

In addition, throughout your research, you must report promptly to the REB:

- Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
- All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
- New information that may adversely affect the safety of the participants or the conduct of the study;
- Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

Stephen Cheung, Chair
Health Science Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of research at that site.

Appendix B

Letter of Invitation

[DATE]

Title of Study: What is the influence of music on performance in practice and competition among university age competitive fencers?

**Principal Investigator: Maureen Connolly, Professor, Department of Kinesiology, Brock University
Student Principal Investigator Tamara Tait, Student, Applied Health Sciences, Brock University**

I, Maureen Connolly, professor, from the Department of Kinesiology, Brock University, invite you to participate in a research project entitled What is the influence of music on performance in practice and competition among university age competitive fencers.

The purpose of this research project is to understand what role music may or may not play into a fencers practice of performance. Should you choose to participate, you will be asked to participate in a in person or online interview and a brief read of the transcript typed to ensure what was say was correct once the interview is complete.

The expected duration will consist of a 45 minute to an hour-long interview and member checking to follow. Member checking will be used to ensure what was said from the participants was accurate and correct. The participants will receive the transcript via email and will have 2 weeks to return the transcript with modifications or corrections. If the transcript is not returned within 2 weeks, the principal student investigator will assume that the transcript is fine and will proceed to the next interview.

This research has the potential to benefit the participants by being able to reflect on their own fencing skills in relation to music. They can reflect on how music could potentially help or hinder their performance and how to use the music they hear to their advantage. This awareness may help the participants become more aware of how the music impacts their performance thus improving the overall fencing skills or possibly limiting overall fencing skills. Although this study is looking at participant perspectives of how music is used for them, the coaching staff can learn indirectly from the study based off the potential findings in the study. The study can also be used beyond fencing, but into any individual, dual, or team sport or activity that requires some form of rhythm component.

This is a single site project only taken place within Brock University.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905 688-5550 ext. 3035, reb@brocku.ca)

If you have any questions about the project or want some more insight on the study, please feel free to contact myself or the student principal investigator, Tamara Tait.

Thank you,

[Insert Principal Investigator's Signature]

**Principal Investigator:
Maureen Connolly
Professor
905-688-5550 Ext. 3381
mconnolly@brocku.ca**

**Principal Student Investigator:
Tamara Tait
Student
M.A Candidate – Applied Health Sciences
t15zl@brocku.ca**

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board [REB 22-004].

Appendix C



Participants Needed for Research Study

Are you a member of the Varsity Fencing Team?

Do you have an interest in listening to music?

We want to hear from you about your experiences with music in relation to your fencing!

Brock University is doing a research study to understand the influence of music on performance in practice and competition amongst university competitive fencers.

If you would like to know more about what we are doing or if you are interested in this project, please contact Tamara Tait at tt15zl@brocku.ca or Maureen Connolly at mconnolly@brocku.ca. This poster has received ethics clearance by the Brock University Research Ethics Board- REB #22-004.

Appendix D

Informed Consent

Date:

Project Title: **What is the influence of music on performance in practice and competition among university age competitive fencers?**

Principal Investigator (PI): Maureen Connolly, Professor
Department of Kinesiology
Brock University
905-688-5550 ext.3381, mconnolly@brocku.ca

Student Principal Investigator (SPI): Tamara Tait, Student
Department of Applied Health Sciences
Brock University
Tt15zl@brocku.ca

INVITATION

You are invited to participate in a study that involves research within the Olympic fencing community and the music realm. The purpose of this study is to understand what role music may or may not play into a fencers practice or performance. This research will look at what is the influence of music on performance in practice and competition among university age competitive fencers within Brock University Varsity fencers. If you are a novice or expert in fencing, we are eager to hear your opinions and discussions on this topic. No music background required.

WHAT'S INVOLVED

As a participant, you will be asked to participate in a 45 minute to an hour-long interview where the student principal investigator will be asking questions about fencing practice, fencing competitions, your background with music, and music's relation to your fencing as a competitor. Once the interview has finished, member checking will be done with the participant to ensure the transcript is accurate and to add or change any points that you want. The participant will have 2 weeks to review the transcript. If the transcript is not returned after 2 weeks, the principal student investigator will assume the transcript is fine and will move onto the next interview. Participation will take approximately two hours of your time. In addition to the interview process, general observations will be made throughout the duration of the fall term. The focus of the observations will be on the role music plays on practice and performance. Observations made will be unobtrusive and will not focus on or identify any individual.

POTENTIAL BENEFITS AND RISKS

A potential direct benefit to the participants can include being able to reflect on their own fencing skills in relation to music. They can reflect on how music could potentially help or hinder their performance. This awareness may help the participants become more in tune of their own fencing and how the music impacts their performance thus improving the overall fencing skills. There are minimal risks associated with participation in this study due to Covid-19. All protocols will be followed for the duration of the study to mitigate the potential spread of Covid-19.

CONFIDENTIALITY

The information you provide will be kept confidential. Your name will not appear in any thesis or report resulting from this study; however, with your permission, anonymous quotations may be used. Shortly after the interview has been

completed, I will send a copy of the transcript to give you an opportunity, to confirm the accuracy of our conversation and to add or clarify any points that you wish.

Data collected during this study will be stored on a password protected computer and external hard drive incase any data my be lost. Both will always be placed under the principal student investigators watch or behind a locked door. Data will be kept for 6 months after the final paper has been written, after which time all copies of data collected will be erased immediately from the computer and hard drive.

All access to this data will be restricted to the principal investigator, Maureen Connolly, and the principal student investigator, Tamara Tait.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish to participate, you have the option to decline to answer any questions or participate in any component of the study if you do not feel comfortable. Further, if you choose to withdraw from this study, you can do so at any time. All data that was previously collected will be destroyed and removed from the final thesis.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available once the study has been finished. The student principal investigator will contact the participants via email providing a thank you statement for your active participation within this study, a summary of the findings for each participant individually, a summary of the findings for the entire study prior to it being published, and a future email providing information on how to find the study once it has been published.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact Maureen Connolly or Tamara Tait using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University [REB 22-004]. If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____ Date: _____

Appendix E
Interview Questions:

Part A:

- 1- Tell me who you are, where are you from, how long you've been fencing, what got you interested in fencing and what keeps you interested?
- 2- Describe what I would see at a typical fencing practice? What do you find helpful during practice?
 - a. i.e., Visual demonstrations, verbal demonstrations, physically doing the actions, having music in the background, not having music in the background?
- 3- How did you get your timing in fencing?
 - a. How long did it take to get your timing?
- 4- How do you know what rhythm is right for you?
 - a. How do you decide your rhythm?
 - b. Can you explain the role of rhythm in fencing?
 - c. What role do you think music might play in fostering this rhythm component?
- 5- What do you find the hardest about tempo changes?
 - a. How do you think music has helped you with tempo changes?
 - b. How do you think music can help you in general?
- 6- How do you get prepared for a competition?
 - a. How do you warm up?
 - b. Is it similar to practice?
 - c. is music involved?

Part B

- 1- Describe the relationship you have with music in relation to fencing practice?
 - a. Describe the relationship you have with music in your daily life?
- 2- What are do you think about having music in the background at practice?
 - a. What are the pros and cons of music in the background for you?
- 3- How does music effect your emotional state while fencing? What is your playlist? What do you listen to while:
 - a. Warming up
 - b. Getting 'pumped up'
 - c. when you are down
 - d. calming down
- 4- How do you feel about listening to music at practice and or pre competition?
 - a. How does music effect your emotional state?
- 5- How do you feel about listening to music while you fence during practice?
 - a. How do you think music has made an influence on your fencing during competition?
- 6- What do you hear when you are fencing?
 - a. At practice and competition

Appendix F

Coach Sample Transcript

Coach

ahh, It's a challenge. Fencing is not a static sport. Always evolving. Preconceptions that we had, you know. I started in this sport, there were elements of how of timing and tactics, athlete development is constantly evolving. It Is really an art and science all wrapped up in ah one.

Tamara Tait

Describe what you would see at a typical fencing practice.

Coach

Absolutely. Umm in the typical fencing practice, we run a very structured practice. So. Most generally, in most fencing programs, it starts off with some generalized warm up, generalized warm up where patterning footwork, half an hour to 35 minutes of foot work and then from footwork it would, should transition some sort of pairs drills in which they can then incorporate their bladework with their footwork in a controlled environment with a variety of pairs. Progressive variety of pairs. Umm and then from there open bouts open bouts allows you to take the skills and techniques that you've learned through. Uh, the drills into a bout and while those bouts are going on, athletes who need additional support or pulled away and can ask questions to the head coach or a master coach.

Tamara Tait

So what do you find helpful during practice?

Coach

Umm structure. having a consistent overarching structure, a pattern that athletes come in, it follows the same pattern every night, allows them to relax and building that consistent pattern. Drills and footwork will change throughout the season based on the training plan, but the actual consistency and addition of the practice gives comfort to the student athlete or the athlete, or all you know, several clubs were asked. That seems consistent across all you know, athletes want that that pattern of template of a practice that they can go and feel it. You know. They know what they're doing and then they can focus on the true aspect of this, is actually fencing itself.

Tamara Tait

Alrighty. Umm, So would you use visual, verbal and physical demonstrations to help demonstrate complex topics or actions?

Coach

Yes, actually, physical, physical, visible, and auditory. I use a lot of auditory patterning too, so you know, I'll typically explain the action if, as best as possible and in some cases, I'll demonstrate the action and as best as possible, and then if there's a specific timing that needs to occur. I'll use some sort of auditory mnemonic that allows them to kind of understand the timing that we're looking the beat attack, you know, it's "Bubba". They can feel that the action in their blade through replaying in their mind the auditory cue I've given them. and then they try and mimic the visual component Umm through what I've demonstrated.

Appendix G
Epée Sample Transcript

Tamara Tait

Yeah. Umm. So specific to you, how did you get your timing in fencing?

Epée Participant 1

Like how did I develop my timing like in, while fencing?

Tamara Tait

Yes.

Epée Participant 1

Umm, I think you have to have a certain level of footwork to do that because you have to be like you can't concentrate on like a performing great footwork and still get still have good timing, so I think you have to have generally great footwork that you don't think of and it's still really good. You're jumping all over and also the style of fencing contributes to this. I think if you're more of a bouncy fencer like me and not like a traditional moving, you know stepping fencer. Then you also have a better chance of getting a more timely hits and and being better at timing because you're so unpredictable like this is so true for fencing like moving around is like is, you know essential from my fencing too and I think yeah, you know you're bouncing around and you can just, you know, you're always moving forward every second move I have is a is a forward move, so how would the person know that you know which is gonna be the attack so I think it's it depends on the style of fencing and and you have to have a good level of footwork, yeah.

Tamara Tait

alright, ohm. If you can give me like a ballpark answer of how long it took for you to develop your timing.

Epée Participant 1

Umm.

Tamara Tait

To to like a a place where you think it's. It's. Well, obviously it could still be improved on, but you you like it.

Epée Participant 1

Yeah. Yeah, well, it depends. Against who, can you perform that or or or you know it depends on a lot of things, but I think it or who you're comparing it to, but maybe two years like if you put effort in it, right, if you put effort in footwork and and I think again footwork is still important for timing. Two years. Yeah, yeah.

Tamara Tait

Two years alrighty.

Appendix H

Foil Sample Transcript

Tamara Tait

On that note, just a general question, do you think music helps you in general?

Foil Participant 1

OK. Haha, You know. I don't want to say no because that seems quite negative, but I also don't wanna say like 100% music helps me. For me personally, the times when I've really listened to music and I think this is partly due to inexperience, I would say looking back at it now, So now there's a lot of studies that show the music is quite beneficial, but I've done it before competition and then sometimes I feel personally that it distracts me because I'll be in a bout, I'll be like thinking the song lyrics opposed to just fencing. Umm So I've never tried classical music, so I don't know if that would have a difference. But I have not seen drastic benefits from using music and fencing and and like I said for so long where I trained before coming here, we never had music. So I think I was so used to having like a certain environment, that I just grew up with, so I am, I never really thought of changing it, I would say.

Tamara Tait

Mm-hmm. Alright, cool. Umm So can you describe to me how you get prepared for competition? So how do you warm up because it's similar to practice?

Foil Participant 1

Umm.

Tamara Tait

How do you go through your competition day?

Foil Participant 1

Yeah. Umm. Get competition days as stressful and I think the more experience, you get a little bit better. But I think regardless that always gonna be a little bit nerve wracking. I try to do the warm-up that we do at practice just because I think it's a good length and it kind of warms up all those necessary muscles, but personally also make sure that do my arms, because that's not in the warm-up. And I actually kind of take some time to Like I said, be kind of in a still quiet area. Like I'll go and I'll find a hallway that's not too busy. Not too many people. I actually don't really listen to anything. It kind of just try to it's usually me rehearsing sayings in my head. Umm, sometimes you can go to get caught up in the pressure that you put on yourself. So just try to remember like, hey, I'm good to have fun and every competition at learning experience. So, kind of just try to see positive, positive affirmations to myself and then it may do warm up bout but I just try to chill out mostly and make sure I have all my gear ready. Make sure you know where my piste is. Yeah, just kinda take it easy.

Appendix I
Sabre Sample Transcript

Tamara Tait

Umm. So moving forward, how do you know what rhythm is right for you?

Sabre Participant 1

No rhythm is right for me. Umm. I find determining what rhythm is right for me. Hmm. Ill have to think about that one for a second, I think. I like determining what rhythm is right for me, I can really tell. I mean, I guess just based on how well the works to be honest, cause so much of my process is like trial and error. But in terms of like moving with rhythm on my own in terms of like self, self-directed footwork, I find that it feels right. Umm. When I can feel like almost a snap to it, if that makes sense. Where I can? I think.... I know the rhythm feels right for me when I feel like I have it very controlled but I have the ability to change it. That makes sense. Isn't Saber a lot of it is the change of rhythm. Umm. In order to throw off the opponent and make yourself unpredictable. So I find having the rhythm. Be right for me is when I'm able to snap into a motion very quickly but also change how I move. And like, slow it down when I need to. And I think that answered the question.

Tamara Tait

Yeah. Yeah, it did.

Sabre Participant 1

Oh good.

Tamara Tait

Umm. Can you explain? The role of rhythm in fencing in your own words.

Sabre Participant 1

The role of rhythm in fencing I find, especially in Saber, where so much of, the bout is that first like second or two when you're getting off the piece to determine who has priority. The role of rhythm I find in that is, I think the rhythm is what allows you to, to capture that priority immediately. Get in there quick, UM in react quickly in terms of like whether it's reacting to the call of the ref to go or reacting to the movement of your opponent. And then on the flip side, I think rhythm also plays a very big role in prompting reaction. Whether it's speeding up to force them further on their back foot or slowing down to throw them off, or throwing a little bounce in to essentially faint to movement. I think to to boil down the roll of rhythm, because I think it realistically it is a lot of the sport. I think you could describe it as rhythm. The role rhythm plays is determining when you react and how you can control your opponent's reaction.

Tamara Tait

OK. That's cool answer, not going to lie.

Appendix J

Sample Open Coding

- Practice is very structured and starts with:
 - Warm up, Patterning footwork (Self guided), Team footwork, Blade work in pairs, Free fencing
 - With individual lessons
- Within the practice structure, it allows for time and support for the athletes to grow
- Structure is very helpful at practice
 - This allows the athletes to become familiar and comfortable with what is happening
 - Athletes want structure
- Uses 3 forms of delivery while coaching
 - Physically doing the actions (allowing them time to feel the action from themselves)
 - Verbally describing the actions (Using correct terminology)
 - Visual demonstrating the actions (allowing them to see proper form)
- Finds music helpful for many factors
 - It lowers the over all stress of the environment and makes them able to perform
 - Allows the athlete to fall into a rhythm that is provided for them (subconscious or not)
 - Majority of practice should have subdued music to keep the energy output at a moderate pace
 - While boutng at practice, the music should be at a higher tempo
- Used to use music, specific songs to mimic his fencing style of fencing
- Timing for athletes and coaches are very different
- Has a very sound understanding of the sport, timing, rhythm, initiation and feel
- Was difficult to get their timing as an athlete, not musically inclined
 - But was mathematically inclined, as there is math in music
 - With this they understand the underlying premise of music regarding
 - But still difficult to fully grasp
- Completion of one attack is one tempo
 - They are really good at finding initiation or breaks half beats in these tempos
 - If you visualize the attack you can use a counter attack at the appropriate time
 - Ultimately breaking the attack into a shorter duration
- To get to this point of understand timing it took a lot of constant repetition and a lot of failure
- Has competed provincially, nationally and uses these experiences to help gain a better understanding of the fencing timing, tempo and rhythm.
 - In the first couple competitions competing they had a very hard time competing, lots of failure until they were able to finally understand the timing and tempo of the match
 - You get an innate feeling for the tempo and timing once doing it long enough

Appendix K

Sample Axial Coding and Photos of Process and Selective Coding

Weapon Specific: Foil

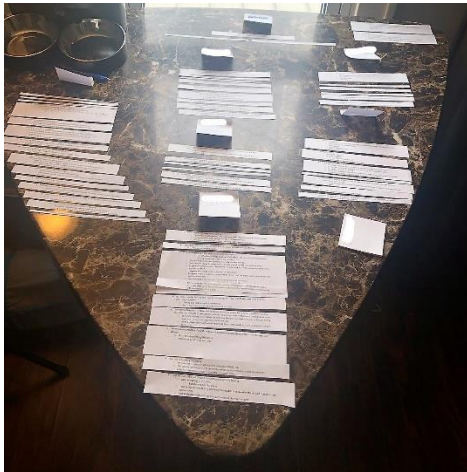
- Collectively, timing is difficult because it's based on who you are fencing
 - Different heights, different speeds
 - This ultimately moves the target area, not staying consistent between each fencer.
- Collectively, music is used for motivation and can alter emotions to match what is being played
- Collectively, they all think that music does not help with rhythm.
- Collectively, it is difficult to move from fast to slow, regarding speed of the footwork/blade work
- Collectively, they all use music to fill the dead air, do not like having no sound
- Collectively, they think music can be distracting at practice
- Novice fencers think of rhythm as more of a physical feeling and timing and tempo are internal feeling
- Experienced fencers, 8+ years, think of rhythm and tempo changes as a physical feeling and timing is an internal feeling
- Collectively, they all like the structure of how practice is run, and how fencing is run. The technical and construct

Weapon Specific: Epée

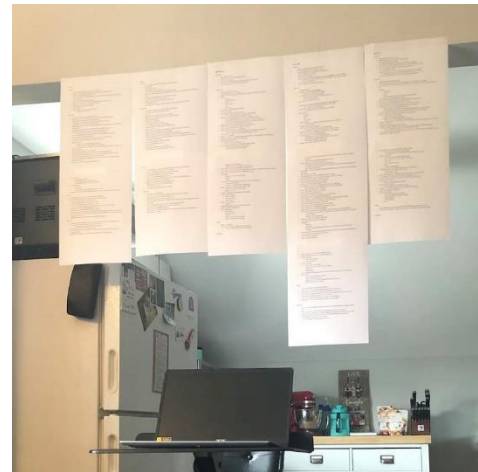
- Collectively, they use different techniques to earn point due to the nature of the weapon
 - Style and rhythm is free to develop
 - Due to not having the priority rule
- Collectively, they use music to for motivation and can alter their speeds based on the pace of the song being played.
 - This can be both good and bad depending on what is being played.
- Collectively, the hardest part about tempo changes is knowing when to use them
- Collectively, they think of rhythm and tempo changes as a physical feeling and timing is an internal feeling
- Collectively, it is difficult to move from fast to slow, regarding speed of the footwork/blade work
- Experienced fencers, 8+ years, would be considered a 'bouncy' fencer but will be more stationary when needed against specific opponents
 - They change their style to match or overcome their opponent
- Novice fencers, will be more of a traditional fencer and will move more concrete
 - This is due to learning how to approach their own fencing

Weapon Specific: Saber

- Collectively, due to the nature of the speed of the weapon, they often get stressed, make actions too big, and forgets about tempo changes
- Collectively, they all believe music can help with timing but the type of music is important
- Collectively, music is used for motivation and can alter emotions to match what is being played
- Collectively, they do not use music to help with tempo changes but they think that it could be helpful to learn
 - They do not necessarily use.
- Collectively, they consider rhythm to be the speed and of the sport
 - To gain priority, or to earn it first
- Novice fencers, think that there is a connection between body and mind through music
 - This can be emotions and between what they hear to how they react.



Axial Coding for Coach



Weapon Specific Axial Coding

Appendix L

Sample Selective Coding

Hearing:

- Fencers sometimes find a way to get into their rhythm while listening to the opponent's footwork and blade contact
- Some uses sounds but are unsure of how to use them to their advantage
- Music tends to be a distraction to some fencers causing them to lose focus
- The silence can also be a distraction and some fencers like to have music in the background to fill this silence

Physical Actions:

- Physical actions are associated with rhythm and tempo
- it is important to develop their own rhythm within a bout and match a fencers energy level and not footwork
- Starting slow and finishing fast

Timing and Tempo:

- Need to be physical fit to perform tempo changes correctly
- The best way to get your timing is bout in competition
- As one wants to remain unpredictable with actions, one may also have a hard time reading their opponents unpredictability

Focus of Attention:

- Some fencers get distracted with music being played and this effects their attention
- Due to their being many aspects of fencing to focus on simultaneously, it is often difficult to focus on which specific aspect that needs attention: This comes with practice and compartmentalizing which skills need more attention than others

Emotions:

- Rhythm can be altered by mood
- Each person has their own taste in music and often reflects how ones emotions are used while fencing

Structure of the Sport:

- Most fencers say that music at practice is motivational and helps with fencing energy
- Most fencers like how the practice is structured but sometimes the fencers will focus on what they enjoy versus what they need to work on

Coaching/Learning

- Each person learns through different forms of coaching: visual, verbal, auditory, physical doing the actions
- Fencers prefer direct instructions on how to fix their mistakes
- Some fencers use sounds to describe or learn movements or footwork patterns
- The most boring and repetitive tasks are the most important for learning