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Speed in music

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Conclusion

In music, time is constituted for performers and listeners through patterns of sound and silence. The rate at which they unfold is their speed, influencing listeners' perception and emotional responses profoundly. Within European art music discourses from the late eighteenth to early twentieth centuries, pedagogical and critical sources often aligned faster tempos with vitality or agitation and slower tempos with gravity, devotion or solemnity, while genre, meter, affect, and performance situation (for example liturgical, theatrical, salon or concert hall settings), together with venue acoustics, social function, and local listening conventions, mediated these associations. However, speed in music is far richer and more nuanced than tempo alone suggests. Over the last century, performers and composers have radically expanded the ways in which musical temporality can be conceived, experimented with, and embodied. To a great extent, this expansion was enabled by technological innovations including disc and tape recording, digital instruments, and software environments, which made possible new modes of listening, analysis, and composition. In doing so, they broadened the expressive palette of speed itself, shaping how fast or slow music can feel, how motion is perceived, and how time is experienced, and they explored extremes at the edges of performability and perceptibility. For music played by instrumentalists from notation, the palette of tools for speed includes traditional devices such as tuplets, rhythmic grouping, metric modulation, and tempo change, as well as newer structural strategies, for example click track polytempo, algorithmically generated scores or orchestrated spectral density manipulation. Speed is tied to compositional choices, interpretive decisions, performative embodiment, and listener engagement, making it an expressive component of musical meaning and experience. Every musical piece inherently embodies an approach to speed, implicitly or explicitly communicating something about its pacing. This dissertation has demonstrated a practice-based conceptual framework for understanding musical speed, integrating rhythmic techniques, performative embodiment, theoretical reflection, and situated musical knowledge. I have argued that speed is actively experienced and interpreted, rather than passively implemented, thereby encouraging interdisciplinary dialogues across artistic, cognitive-scientific, and philosophical domains.

Despite its ubiquity and centrality, speed as a concept remains surprisingly underexplored in relation to musical content and expressive potential. Musicological research has largely limited its discussion of speed to investigating the somewhat quantifiable parameters of tempo or microtiming, neglecting the full set of parameters responsible for the unfolding of music, and also broader, integrated expressive implications. Scientific research has touched upon aspects of musical speed through studies on timing accuracy, rhythmic synchronization, and physiological responses, yet these insights rarely integrate into concrete practical frameworks. Cognitive science and neuroscience offer significant insights into rhythmic processing and timing deviations, but their translation into tools and implications that are directly usable by musicians, including composers, remains underdeveloped. By highlighting these oversights, I have taken a holistic approach to speed that emerges from compositional, performative, and listening interactions, alongside a methodological, systematic, and reflective practice in which I applied, tested, and evaluated rhythmic tools (for example tempo transformation, tuplet systems, density strategies, and polytempo coordination) as well as embodied engagement, embedded within a musical practice and body of work. By explicitly theorizing speed in and through music as an expressive dimension, this dissertation invites new considerations of how musical pacing influences formal development and musical communication understood as interactions among performer and instrument, instrument and acoustics, musician and musician, performer and audience, medium and technology (such as guitar and amplifier), and between a composition and music history. How speed functions in creative artistic practice, taking real-world situations into account, provides a working reality which balances a wide range of considerations that often challenge single rule prescriptions about tempo markings, meter and subdivision, ensemble synchronization, and literal score fidelity. My perspective, with extensive practical experience as a

composer, performer, and educator, enabled an insider's research into how speed functions practically within musical contexts.

In concluding this dissertation, I return to the central research inquiry: *What is speed in music, and how can I explore it creatively and practically within my artistic practice?* Throughout the preceding chapters, this inquiry has unfolded along two intertwined threads. In the first one, I have examined speed through concrete musical and bodily phenomena – from the thresholds of speed (illustrated with extreme Beethoven tempo examples) to rhythmic structures, temporal resolution, density, tuplets, and polytempo. In the other I have framed musical time via the concepts of smooth and striated time, drawing on ideas of layered identities, nonlinear temporal experience, and individual perception. The following discussion synthesizes these threads, drawing together the explorations of tempo thresholds, temporal resolution limits, density and motion, the (deconstructed) smooth/striated dichotomy, the LEMI model (Listener, Environment, Musical Interaction, a triadic account of how listener, environment, and musical material jointly shape experience) and situational perception (fast improvisation). In doing so, it traces how artistic, scientific, music-theoretical, and philosophical insights on speed intersect and how they converge in musical practice.

From an analytical and performative perspective, my research reaffirmed that speed in music is far more than a metronomic marking – it engages the physical mechanics of performance, the architecture of rhythm, and the limits of human perception. Chapter 2's section, [Thresholds of Speed](#), was based upon my creative reworking of Beethoven's *Ninth Symphony* at radically different speeds, exploring both gradual shifts and extremes. This experiment compressed and expanded the work from durations of hours to fractions of a second, showing how identity changes at different perceptual thresholds. The same material iterated at different speeds undergoes qualitative shifts: at certain thresholds details collapse into texture, and beyond fusion rates repetition even becomes pitch. Speed thus spans from discrete motion to continuum. Pushing tempo to this brink, as in the performance of the movement "Telescopic Ladder" from my composition *Tools*, can paradoxically produce a textural sound, suggesting that when such loss of precision is anticipated and shaped it can be taken up as a compositional and performative resource.

Investigations of rhythmic structures and density showed how the number of musical events per unit duration and their distribution in time shape our sense of momentum or motion in music. Composers employ tuplets to stretch or compress the beat, creating new densities that effectively generate nuanced intermediate speeds within a single pulse and introduce new qualities of motion to the music. Likewise, the exploration of polytempo demonstrated how multiple tempi can coexist to enrich the temporal fabric of a piece. By superimposing multiple speeds, composers can create a stratified time experience: each layer presents its own rhythmic identity, yet the ear can also perceive the combined result as an integrated whole. This is remarkable in relation to speed because perceived pace can become plural and dynamic, depending on whether attention tracks a single layer or the overall composite texture. In my compositions *Building Music*, *For Bob* and *Sydney Polypulse*, I experimented with such stratifications, creating textures that allow for individuality and cohesiveness within layered tempo environments.

Crucially, these structural and compositional discoveries are inseparable from the performing body. Especially in Chapter 5, in discussing the "[speed of creation](#)", I show that playing at extreme speeds couples two processes: selective conscious choice within very short windows, and automatic execution supported by trained motor programs and muscle memory. In fast improvisation, deliberation, embodied technique, and situational awareness operate together as the musician chooses a continuation, rapidly considers alternatives, and executes it near the limits of playability. Speed therefore relates to a shifting balance between preparation and in-the-moment decision making, a balance that characterizes all musicking, but that becomes especially constrained and consequential at extreme rates of action. For

instance, in *Torrent* I confronted this directly by creating passages so rapid and dense that performing them became an exercise in balancing tension and relaxation, finding efficient movement strategies to maintain accuracy. These concerns extend from the moment of creation to the later performability of the resulting materials. In *Building Music* the articulation limits of repeated notes tested endurance and precision, and in polytempo pieces performers confronted the body's natural tendency to synchronize with nearby musicians, requiring heightened attentional control. The compositional lens of this research therefore provided concrete strategies to harness speed, while also charting the outer limits of the playable and the perceivable.

Parallel to the compositional and musical analysis, I employed a philosophical framework to make sense of musical speed, chiefly through the concepts of smooth and striated time. Borrowed and adapted from Boulez's terminology, these concepts offered a vocabulary for understanding different modes of temporality in music. In striated time, musical events are organized along a grid of countable, discrete units. Rhythmical grids such as pulse and triplets, whether implicitly conceived by the performer or explicitly expressed in the music, produce a high degree of regularity, and only such striations can give measurable accounts of speed because of their regularity. By contrast, smooth time is a temporal space that unfolds without the guidance of a strict pulse or predictable measure, experienced in musical moments where time feels suspended or fluid, for example in an unmeasured cadenza, a sustained drone, or improvisatory passages that follow gesture rather than a fixed tempo reference. Striation enables character in several ways. The superimposition of grids, through the use of triplets, creates structures with different speeds and different numerical properties, enabling variety in phrasing. At the same time, however, rhythms articulated with a grid can create irregularity that destabilizes striation, and also microtiming in human performance produces expressive deviations from it. This interplay suggests that smooth and striated time are not strict opposites but endpoints on a continuum, with most musical experiences blending elements of both. Striation clarifies musical structure, enabling salient qualities such as pulse, systematic phrasing, and coordination between musicians, while smooth time emerges from expressive elements such as microtiming and irregular rhythms. By framing speed in terms of this alleged and deconstructed dichotomy, it can be understood through a lens that illuminates its significance for both listeners and creators.

The idea of layered identities in musical time emerged from combining the smooth/striated framework with the polytempo and density techniques described earlier. While traditionally layers in music have their own identity of speed (think, for example, bass and melodic lines), this conceptualization leads to avenues of new creations. Each independent tempo layer in a polytemporal piece may possess its own striated temporal character, yet the coexistence of multiple layers creates a higher-level smoothness – an unpredictable, nonlinear superposition of speeds. This creates a situation where the perspective of the listener emerges as important in the experience of speed. Listeners might latch onto one layer or another at a time, effectively shifting their perspective among multiple temporal identities. This relates to the notion of nonlinear time: music need not unfold as a single, linear narrative that everyone experiences identically. Instead, as I argued in the section on LEMI and situational perception, time in music is multi-dimensional and personal. Different individuals may experience the form and speed of a piece differently, depending on where they focus their attention and how they internally measure the passing of time. These coexisting interpretations underscore a key philosophical insight: musical time is not monolithic. It is experienced through a lattice of situated layers even as more objective structures underlie the surface. Moreover, listening is not purely forward moving. Recognition of a returning theme, harmony, or motive recruits memory and can produce a partial reexperience of earlier moments, which can compress or dilate the felt pace and further undermines any strictly linear account of musical time.

The role of the listener's and performer's situated temporal experiences has been a through-line in this discussion, reinforcing a concept often highlighted in phenomenological and poststructural thought. Drawing on the LEMI model introduced in [Chapter 2](#), I accounted for how contextual and personal factors shape the perception of musical time. The LEMI framework catalogues the "multitude of factors which impact on [the] sense of time during music listening," from the listening environment to the listener's mood, age, familiarity with the music, and even the performer's approach, and emphasizes that these elements are dynamic and can shift during the listening experience (Phillips, 2022, p. 11). Donna Haraway's concept of *situated knowledge* resonates strongly here. Translating her insights to musical terms, any judgment of musical speed arises from a particular situated standpoint – that of a given listener or performer in a given moment and place. Embracing this idea enriches the approach to speed: it urges consideration of whose sense of time is being referenced, and how differing circumstances might yield different experiences of the same tempo or density. Moreover, it aligns with Christopher Hasty's theoretical stance that meter and rhythm are *emergent* in real time, not fixed absolutes. Hasty posits that meter is a *constitutive process* wherein each event's duration is shaped by the next, emphasizing process over product and qualitative change over quantitative measurement (Hasty, 1997, p. x). This view reinforces my philosophical throughline: musical time (and thus speed) is something we actively create and perceive in the moment.

One of the most important outcomes of this research is the realization of how these technical and philosophical perspectives on speed converge in artistic practice. Far from being contradictory, they inform and enhance each other. The music-theoretical analyses provided the tools and parameters, while the philosophical inquiry provided the aesthetic and conceptual grounding. In composing and performing new works like *Torrent* and *Sydney Polypulse*, I found that the practical decisions were often guided by conceptual aims. For example, in *Torrent* I wasn't exploring extreme speed merely to showcase virtuosity; rather, I was investigating what musical intensity emerges when notes saturate the ear's attention. The result was a composition that deliberately rides the line between order and disorder – a flurry of figures executed so rapidly that they coalesce into a kind of smooth textural wash, perhaps similar to jazz critic Ira Gitler's description of saxophonist John Coltrane's improvisations on his album *Soultrane* as "sheets of sound" (Gitler, 1958).

Conversely, in *Sydney Polypulse*, my use of multiple simultaneous tempos was a practical outgrowth of wanting to represent *layered time* in music – an idea directly inspired by the philosophical discussions of nonlinear, individualized time and the uncoordinated sounds in everyday life. Each instrument operates in its own tempo "orbit," creating a musical scenario where time is relative depending on which layer one attends to. Implementing required technological solutions such as haptic metronomes and spatial separation for performers to maintain independent tempos, proving that conceptual goals can drive musical innovation. A particularly clear example is my etude *The Speed of Time*, which embodies many of the dissertation's core themes in a single work.

Example 6.1. [The Speed of Time](#), video.

Each bar lasts precisely six seconds, articulated by an audible metronome click that externalizes clock time. Against this fixed reference, the musical surface moves from isolated attacks to progressively denser subdivisions, so that what begins as an almost schematic striated tuplet gradually fills the span with increasingly continuous activity. The metronome therefore sets machine precision against the performer's microtiming and bodily variability, making audible how human timing both aligns with and departs from an external grid as density increases. The work thus bridges technical and philosophical perspectives by showing how density, tuplet structure, smooth and striated time, and the relation between clock time and

lived duration intersect in a single artistic practice, while also raising questions about the limits of performance and the role of technology in amplifying human characteristics.

As shown in *The Speed of Time*, the convergence of technical and philosophical threads reframed my approach to compositional and performative strategies. Instead of viewing speed as an isolated parameter, I now approach it as a portal to reimagining musical structure and experience. A composition can be structured around gradual changes in density, starting from a sparse texture and accelerating into a flurry, not just to increase excitement, but to explore how the very *perception* of time morphs along that trajectory. An improviser might deliberately shape a rubato passage to evoke smooth time before locking back into a striated, metered groove, sculpting the listener's temporal experience between a feeling of timelessness and the structure of clock-time. It is a shift from thinking of pace as a static setting to understanding speed as form-bearing. Just as harmony or timbre can define a piece's identity, so can the deployment of speed and temporal interplay.

The theoretical grounding from scholars like Hasty, Clarke, and Haraway, alongside empirical models like LEMI, fortifies these practical insights. Hasty's processual view of rhythm validates the creative intuition that time can be stretched, contracted, and formed by musical events themselves. Clarke's ecological and embodied perspective emphasizes that the experience of musical time is an active engagement. Listeners and performers enter a temporal relationship with the music, aligning their bodies and attention with its rhythms and flows (Clarke, 2005, p.71). This encourages performers to be conscious of how their own sense of time can influence the audience's, and conversely how a listener's background might influence what they hear in a piece (Phillips, 2022). Haraway's philosophy (1988), urging acknowledgment of partial perspectives, adds an ethical and epistemological dimension: it suggests that as artists we should embrace the diversity of temporal experiences rather than attempting to impose a single "correct" one. In practical terms, this might mean designing works that allow flexibility or creating listening situations that invite introspection on time.

Ultimately, by integrating the technical mastery of speed with a philosophical understanding of time, this dissertation offers a comprehensive answer to the first half of the research question: what is speed in music? It is not just a bpm number or a virtuosic feat; it is a multifaceted phenomenon encompassing physical limits, cognitive perception, and conceptual meaning. Speed can be metric and mechanical, but it can also be fluid and experiential. It lives in the tension between the quantifiable and the ineffable – between the tick of the metronome and the felt duration of a moment, a polarity that resonates with Bergson's distinction between clock time and lived *durée*. Building on this, my earlier discussions of Bergson, Hulse, Boulez, Grisey and Vriezen help to show how smooth and striated models reveal both the possibilities and limitations of temporal description. For instance, Bergson's notion of indivisible duration highlights why moments of musical smoothness resist reduction to metric divisions, while Hulse insists that striation, although real, only emerges within smooth flow. Vriezen's perspective on multiple modalities of musical time and Grisey's expanded typology further deconstruct the binary opposition, suggesting multiple overlapping logics of musical time, from periodic predictability to stochastic distributions. These reflections reinforce that speed cannot be isolated from broader temporal debates: tuplets, polytempo, and density shifts gain significance not only as compositional means but as nodes within a multidimensional network of temporal experience. Thus I have demonstrated how musical tools and philosophical perspectives converge in practice, situating speed within the evolving conversation about the nature of musical time. How can musicians utilize it creatively and practically? By applying the technical findings – expanding rhythmic vocabularies, using tuplets and polytempi, minding bodily ergonomics – in tandem with the philosophical insights – playing with smooth/striated contrasts, addressing the listener's perception, and attending to singular performance situations, venue acoustics, social functions, and listening conventions –

they can craft musical works that harness speed as a core expressive resource. The act of composition or performance becomes, in a sense, an experiment in temporal physics: composing with speed is composing with the fabric of time itself. By reframing compositional and performative strategies around this idea, musicians aim to create music that not only pushes tempos for excitement, but more fundamentally, shapes how time is experienced during the artistic encounter.

The dissertation has integrated theory, analysis, artistic intention, experimentation, scientific literature, best practices, and reflective interventions, yet is still limited in several ways. The artistic research method privileges personal practice, and while this yields depth, it cannot and does not claim universality. In Haraway's terms, this situatedness is not a deficit but an integral aspect of all research. The examples are mostly rooted in my own compositional and performative work, which cannot generalize to all musical contexts. Due to its ubiquity in all music, there is much more to learn about the applications of tools and expressions of speed in the work of other artists. The reliance on Western art music contexts, though enriched with cross-cultural references, leaves scope for broader ethnomusicological comparison. Empirical studies cited are interpreted through artistic framing, not experimental replication. These limits, however, are also strengths, allowing the research to remain grounded in lived practice, explicating individual choices while engaging with broader discourses.

This research may have significant implications, embedded within a musical practice and body of work. It offers practical and theoretical insights across different domains: for composers, it provides tools for structuring speed beyond tempo using density, tuplets, polytempo, and perceptual thresholds; for performers, it suggests strategies for navigating high-speed improvisation, ensemble coordination in polytempo, and expressive timing; for teachers and students, it enriches rhythmic pedagogy, helping learners perceive and produce speed in nuanced ways; for scholars, it reframes speed as a central theoretical category connecting artistic practice to cognitive science and philosophy; and for technology developers, it indicates applications for haptic metronomes and spatialized performance setups.

In order to triangulate what speed in music is, this dissertation took a portfolio approach, assembling a number of investigations which are by no means exhaustive, but which demonstrated essential building blocks and practical demonstrations in sound, visuals, and scores. While the structural nuts and bolts of tuplets and their relation to pulse are clear, further study into subtle perceptual thresholds at the extremes could be illuminating. Comparative studies could also be interesting, testing differences among groups such as musicians versus non-musicians, younger versus older listeners, or European versus non-Western audiences.

Future work could expand in several directions: ethnomusicological inquiry could examine how speed is conceptualized in diverse musical traditions, empirical research could test perceptual hypotheses such as the role of density in motion or the cognitive effects of layered polytempi, and artistic collaborations could further explore polytempo, haptic technologies, and the various potentialities between speed and improvisation. Musicological study could investigate approaches to speed among the different parameters of music - rhythm, meter, melody, harmony, timbre, dynamics, texture - while philosophical reflection could continue probing how speed in music illuminates the nature of time itself. Creative artistic explorations are also possible with many of the findings of this dissertation, such as with pieces that reveal survival-based technical specifications, compositions that explicitly influence temporal resolution and modulate the listener's speed of attention, works that reflect non-human perceptual speeds, pieces that explore changes in expression through subtle speed differences or ones that illuminate microtiming with the use of clock-time instruments. Most importantly, further research can continue to integrate artistic practice with

theory and science, ensuring that speed is not relegated to a secondary parameter but recognized as an important dimension of musical life.

In conclusion, speed in music links measurable temporal structures to lived temporal experience, connecting tempo, subdivision, density, and microtiming to perceived motion, attention, and meaning. This concluding reflection has synthesized technical tools intrinsic to music (rhythm, meter, notation, articulation, and texture) and philosophical perspectives, showing that they converge on a common understanding: musical speed is relational. It arises from relationships – between musical events (technically), between bodily motions (physically), and between minds and contexts (philosophically). The inquiry has come full circle to affirm that, by understanding those relationships, practitioners can gain creative control over speed's role in artistic practice. Tempo and rapidity are no longer treated merely as challenges or effects; they can function as major structural elements that define form, create meaning, and transform experience. In this sense, the concept of speed, enriched by the lenses of technique and theory, reframes contemporary approaches to composition and performance and opens new horizons for the exploration of musical time.