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Memorizing in music

The influence of perfect pitch and learning process

The sounding part consists of the following recording:

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Abstract

This thesis wants to reveal the importance of memory in music, starting from the historical perspective, discovering about the process of memorization in musicians and exploring the relationship between memory and perfect pitch.

Key words: memory, auditory memory, absolute pitch, musical performance, memorized performance.

Introduction

Memorization has played a crucial role in the preservation and transmission of cultural and historical knowledge. Throughout history, different cultures have developed unique methods for memorizing and passing down information, often through oral traditions, storytelling, and music. In preliterate societies memory served as a guardian of cultural heritage enduring the legacy of music, melodies, myths, legends, etc. Understanding these methods provides insight into how memory functions within cultural contexts and its importance in maintaining cultural heritage.

In music, the memorization of works by performers has been an intrinsic practice trough history. Before the widespread use of notation, people often learned and transmitted music by ear, especially in folk traditions. Starting from this historical role of memory in musical practice, this project investigates how memorization relates to absolute pitch and how both phenomena influence musical interpretation and performance.

The central artistic question guiding this research is:
Is there any connection between absolute pitch and the innate ability of memorizing music?

From this question arise related inquiries:

- Does having absolute pitch facilitate the memorization of musical pieces?
- How do different types of memory (muscular, auditory, visual…) interact in the learning and performance process?
- In what ways do these abilities shape the interpretative and expressive dimensions of performance?

To address these questions, this thesis combines theoretical, neurocognitive, and artistic perspectives. It examines the development and mechanisms of absolute pitch, its neurobiological basis, and its relationship with auditory memory. Emotional and psychological aspects of both musical memory and perfect pitch are also explored, with attention to how these abilities influence musicians' self-perception and artistic identity. Cross-cultural perspectives are included to show how different traditions value and conceptualize these phenomena.

A key part of this research is the practical component, consisting of the preparation and performance of my final recital entirely from memory. As a musician considered to possess absolute pitch, this process serves as an artistic case study that allows me to reflect on the relationship between pitch perception, auditory memory, and memorization strategies.

Finally, some historical insights of Liszt, Mozart and Clara Schumann and my own process to the exam concert will offer concrete examples of how these abilities manifest and influence musical careers. This comprehensive approach aims to provide a deeper understanding of the vital role that memory plays in music; it's relation with perfect pitch and its profound impact on musical practice and education.

Memorizing in music

History: memorization and culture

Since prehistoric societies, oral traditions have had a fundamental relationship with preserving and transmitting cultural knowledge in preliterate societies. These oral traditions encompass a wide range of cultural expressions, including myths, legends, folktales, and music. These forms of cultural heritage have been passed down through generations by word of mouth, ensuring the survival of cultural identity and continuity over time.

In the absence of written records, communities relied on the ability to memorize and recite narratives, songs and rituals, encoding knowledge refined across generations. Without a well-developed body of knowledge, structure or methods to retain it in memory, essential practical information about the environment would be lost (Kelly, 2015).

This practice not only maintained the integrity of cultural content but also allowed for the adaptation and evolution of cultural expressions over time. Memory was, and still is, a dynamic process that balances preservation with innovation. In fact, many forms of traditional music rely on this memorization process, where the ability to retain and modify melodies and rhythms is crucial to musical practice.

In the musical domain, memory plays a central role in the oral transmission of songs and melodies. Through auditory memory, musicians learn and internalize melodies and musical forms, which are then performed live or passed on to other generations without the need for written notation. This practice has been common in cultures worldwide, from ancient civilizations to modern ones, where musical memory continues to play a decisive role in musical training and the development of musicians' auditory skills. As Wong (2015) notes, “Auditory memory plays a crucial role in the retention and performance of music, especially in cultures with strong oral traditions”, highlighting the importance of memory in the preservation and transmission of musical knowledge.

It is also important to acknowledge the central role women have historically played in the transmission of oral culture. In many traditional societies, including tribal communities across the globe, it was often the women; mothers, grandmothers, and elder matriarchs, who preserved and passed down legends, lullabies, and folk tales. This legacy has endured across time and geography. Historically speaking, as the primary caregivers in many cultures, women have often been the first to introduce children to stories, songs, and the rhythms of language, planting the seeds of memory from the earliest moments of life. For many, the image that arises when recalling these early moments is that of a mother softly singing or recounting a tale before sleep, an intimate, enduring act of cultural preservation.

This foundational role of memory in musical transmission sets the stage for examining how different types of memory contribute to musical cognition and how phenomena like absolute pitch may emerge from this deeply rooted process.

Memory in different cultures

Across diverse cultures, oral memory has played a central role in preserving musical and historical knowledge before the development of musical notation.

In West African and Yoruba traditions, griots and aròkin serve as oral historians and musicians, memorizing and performing extensive repertoires of historical narratives, genealogies, and music to ensure the transmission of cultural knowledge.

Native American cultures also maintain rich oral traditions where music and storytelling are deeply intertwined. Songs and ceremonial chants are passed down by memory, acting as vital carriers of spiritual and cultural identity (Densmore, 1930; Evers & Toelken, 2001).

In European folk traditions, songs and melodies were transmitted orally, helping to preserve regional identities and customs. This kind of oral heritage often takes root early in life, who does not remember the folk songs, lullabies, or local legends told or sung by parents and grandparents during childhood? These melodies or stories, deeply embedded in memory, travel with us through life, often resurfacing in moments of comfort or nostalgia. They shape our connection to a place, identity, and emotion, and often, when the time comes, we pass them on to our own children.

These practices illustrate how oral memory sustained musical knowledge across time and place. As musical systems became more complex and widely shared, cultures began to develop tools like notation to complement or replace oral transmission.

Evolution of musical notation

With the advent of musical notation, the reliance on memory began to shift. The development of written music allowed for more complex compositions and the preservation of musical works in a more permanent form. However, the skill of memorization remained crucial, especially for performers who needed to internalize music for effective interpretation and performance.

The first forms of musical notation appeared around the 9th century with neumes in Gregorian chant, which indicated the general contour of melodies but lacked precise pitch or rhythm. Varelli (2021) explains how musical notation during this time spread through different regions, particularly in Italy, where manuscripts were crucial in documenting and transmitting musical knowledge. By the 11th century, Guido of Arezzo introduced a system of staff notation, using lines to represent pitch, which laid the foundation for modern notation.

In the 13th century, with the rise of polyphony, mensural notation was introduced to capture rhythm and note durations more precisely. According to Liss (2023), it marked a significant advancement in music notation, as it provided a more sophisticated means of notating rhythm and allowed for the precise representation of time signatures and rhythmic patterns. Despite the advancement of written notation, memorization remained crucial for performers, as internalizing music allowed for effective interpretation and emotional expression. Today, while notation is essential, memorizing complex works without a score is still highly valued in classical music. Additionally, Levitin (2006) explains that the act of recalling and reproducing music from memory involves a complex interplay of auditory, procedural, and emotional

memory systems, highlighting the cognitive richness of musical memorization. This emphasizes the ongoing importance of memorization in the modern performance context.

Music education in historical context

Historically, the training of musicians placed significant emphasis on the development of memory skills. In ancient Greece music was considered a core component of *paideia* or the holistic development of the individual, and the memorization of scales, modes and repertoire was essential (Rocconi, 2023).

In the Western classical tradition, students were often required to memorize scales, etudes, and entire pieces of music, reinforcing technical skills and deepen to the musical understanding. However, before the 19th century, it was often considered inappropriate to perform music from memory, as it was believed that doing so could distort or "alter" the composer's work. Composers and performers preferred that musicians rely on written scores, which they saw as more faithful to the composer's intentions. This perspective began to shift when Franz Liszt became one of the first notable musicians to perform from memory, initially, he did so only with his own compositions. His approach was groundbreaking and, over time, influenced other pianists and musicians, contributing to the acceptance of memorization in performance. Similarly, Clara Schumann followed Liszt's example, becoming one of the first prominent pianists to perform entire concertos and compositions from memory, a practice that was not widely accepted before her time. This shift in performance practice paved the way for memorization to become an integral part of classical music performance (Zixiang, 2022).

Nowadays, in contemporary classical music, memorization is often seen as a mark of distinction and technical mastery, with many musicians being expected to perform from memory, especially in recitals and prestigious competitions, where the ability to internalize and perform complex repertoires without the aid of a score is highly regarded.
In contrast, non-Western traditions such as Indian or African students often learn by listening-imitation-internalization rather than reading scores. In contrast to the Western model, which often emphasizes reading notation and technical precision, these traditions understand musical learning as a rich and holistic process that engages listening, memory, embodiment, and deep cultural immersion.

Types of memory

Memory plays a crucial and highly personal role in musical performance. Musicians, depending on their individual traits, may rely on different types of memory to memorize and perform music. For some, this process is almost instinctive, while for others it requires a more intentional and methodical approach. This variability underscores the complexity of musical memory, where cognitive processes are shaped not only by external factors such as genre or performance context but also by personal learning styles.

In performance, musicians rely on various memory systems to internalize and recall musical material. These memory systems significantly influence how musicians engage with and convey music. The following section explores the key types of memory I have identified as most relevant to musicians, focusing on those that directly impact the memorization and performance process.

Procedural memory

Procedural memory refers to the long-term memory system responsible for the acquisition, consolidation, and retention of motor skills and habitual actions. Unlike declarative memory, which involves the conscious recall of facts or events, procedural memory functions implicitly, allowing for the execution of complex physical movements without deliberate attention. In music performance, it is fundamental for internalizing instrument-specific techniques such as fingering, articulation and breath control. Through repeated practice, these actions become increasingly automatic, enabling musicians to perform with greater physical ease and consistency.

This automatization is not merely a technical asset; it has direct implications for artistic expression. Once the motor patterns are deeply embedded through procedural memory, the performer can focus more fully on musicality, phrasing and emotional nuance. This shift of cognitive load from mechanical coordination to interpretive depth is essential in creating performances that move beyond correctness to genuine communication. Moreover, procedural memory often works in tandem with auditory memory: as the body recalls the physical gestures of playing, the ear simultaneously recalls the expected sound. This interdependence reinforces musical fluency, as each reinforces the other, finger movement confirms pitch, and pitch confirms movement.

Additionally, procedural memory offers resilience under pressure. In high-stress situations where conscious memory may falter, it is often this embodied knowledge that sustains performance. The hands remember where to go even when the mind hesitates. This reliability can be particularly empowering in memorized performances, where internalized motor sequences act as a safeguard against memory lapses, working in harmony with auditory cues and structural memory to support continuity and confidence (Palmer, 2006; Lehmann, Sloboda, & Woody, 2007).

Ultimately, procedural memory serves not only as the foundation for technical mastery but also as a bridge between bodily intuition and musical understanding. It transforms learned motion into expressive language, where the body and ear collaborate to bring music to life without the constant intervention of conscious thought.

Kinesthetic memory

Kinesthetic memory, often referred to as muscle memory, involves the unconscious retention of physical movements through bodily sensation and proprioception. In musical practice, it plays a crucial role in reinforcing motor coordination and spatial awareness, especially in relation to the instrument. This form of memory is developed through consistent, repetitive motion, allowing performers to recall movement patterns without conscious effort. For instrumentalists, kinesthetic memory enables smooth execution of complex passages, accurate shifts, and coordinated fingering, while for singers, it supports breath control, posture, and subtle vocal gestures. The body essentially "remembers" what the mind no longer needs to process actively. This internalized sense of movement becomes deeply embedded, contributing not only to technical precision but also to the artist's sense of physical confidence and comfort on stage. As with procedural memory, kinesthetic memory facilitates fluency, reliability, and expressiveness, freeing cognitive resources for interpretative focus and emotional communication during performance (Ginsborg, 2004; Lehmann, Sloboda, & Woody, 2007).

Auditory memory

Auditory memory involves the capacity to retain and mentally rehearse sounds, making it especially relevant for musicians. It enables the internalization of melodies, harmonies, rhythms, and timbres, allowing musicians to anticipate musical passages, recognize errors, and reproduce music accurately. This type of memory is particularly important in practices such as aural training, improvisation, and memorizing pieces by ear. For performers, a well-developed auditory memory enhances interpretative depth and responsiveness during performance. As Deutsch (2013) emphasizes, auditory imagery and memory are central cognitive skills in musical expertise, supporting the retention and manipulation of complex auditory information. Additionally, research by Buonviri (2015) suggests that reinforcing music notation can improve aural memory for melodies, underlining the interaction between visual and auditory memory processes in musicians.

Visual memory

Visual memory refers to the ability to recall visual information, such as symbols, shapes, and spatial arrangements. In music, it plays a key role in reading and memorizing scores, as musicians often internalize the visual layout of notation, fingerings, or the structure of the piece. This type of memory can help performers anticipate musical content by mentally recalling the appearance of the score or the physical positioning on their instrument. Visual memory supports not only the recognition of patterns on the page but also contributes to building a mental map of the musical structure, aiding fluency in performance (Ginsborg 2004). Furthermore, Deutsch (2013) emphasizes that visual memory interacts with other cognitive

systems, such as auditory and muscle memory, to facilitate comprehensive musical understanding and execution.

Emotional Memory

Emotional memory refers to the ability to recall and relive emotions associated with a specific experience as it can be music. For musicians, it is a critical aspect of performance, as it enables them to convey the emotional content embedded in a musical piece. This type of memory allows performers to connect with the music on a deeper level, using personal emotions or memories to inform their interpretation.

In musical performance, emotional memory plays an essential role in shaping how the music is communicated to the audience. By tapping into emotional experiences, musicians can translate feelings such as joy, sorrow, or excitement into their playing, enriching the performance and creating a more powerful connection with listeners. Emotional memory is closely linked to other memory systems, such as auditory and procedural memory, but it is uniquely focused on the emotional expression of the music.

As Custodio and Cano-Campos (2017) note, emotional memory allows musicians to make expressive decisions regarding dynamics, phrasing, and articulation, which all contribute to the emotional impact of the performance. This process is essential for delivering a compelling and emotionally resonant interpretation of a musical piece.

Declarative Memory

Declarative memory refers to the ability to consciously recall facts, knowledge, or specific events. In the context of music, this type of memory is essential for recalling musical theory, the structure of pieces, or any verbalized instructions about a composition.

For musicians, declarative memory supports the cognitive process of understanding musical form, recognizing patterns, and retaining theoretical knowledge that informs interpretation (Deutsch 2013). It is particularly relevant during the learning phase of a piece, where understanding the structure and theoretical aspects of music aids in memorization and performance (Custodio & Cano-Campos, 2017).

Sensory Memory

Sensory memory refers to the short-term retention of sensory impressions, such as auditory and visual stimuli, immediately after they occur. For musicians, this allows them to maintain fleeting sensory details, such as the sound of notes or visual cues, long enough to process and respond during performance. Sensory memory is particularly vital for musicians when recalling the nuances of a piece from memory, adjusting to changes in tempo, or reacting to the performance environment in real time. In musical performance, sensory memory supports the smooth execution and interpretation of a piece, enabling musicians to integrate both technical and emotional elements seamlessly (Snyder, 2000)

Perfect pitch

Perfect pitch, also known as absolute pitch (AP), is the auditory ability to identify or reproduce a musical note without a reference tone. Individuals with perfect pitch can accurately name the pitch of any given sound, from a note played on an instrument to even everyday noises purely by listening. This skill is often considered an innate trait although some evidence suggests that it can developed through early and intensive musical training (Yang, 2023). Perfect pitch is distinct from relative pitch, which involves identifying pitch relationships between notes rather than recognizing them in isolation.

The study of AP is relevant to multiple disciplines, including musicology, psychology, genetics, and neuroscience, due to its complex cognitive and biological foundations. Although the phenomenon had already been observed in the era of Mozart, it only became a focused topic of scientific research in the late 19th century (Herceg & Szabó, 2023), marking the beginning of a multidisciplinary exploration of its nature and development.

Building upon this foundational understanding, the following sections will explore its neurobiological correlates, developmental aspects, and how it interfaces with musical memory processes.

Neurobiological and developmental basis of AP

Understanding the neurological and developmental underpinnings of absolute pitch (AP) offers critical insights into how genetic predispositions and early experiences shape exceptional auditory abilities. This section explores the neural structures, connectivity patterns, and hereditary components associated with AP.

Neuroimaging studies have consistently shown that individuals with AP exhibit structural and functional differences in their brain's left hemisphere, particularly in the planum temporal, a region involved in auditory and language processing. This area tends to be more asymmetrical and enlarged on the left side in AP possessors, suggesting a specialized cortical organization for pitch processing (Zatorre et al., 1998). These neuroanatomical differences point to a heightened capacity for fine-grained auditory discrimination.

In addition to structural variations, AP is associated with enhanced connectivity between auditory cortices and memory-related areas, such as the hippocampus. This stronger neural integration may facilitate the encoding and retrieval of precise pitch information without the need for external reference tones (Herceg & Szabó, 2023). Neural adaptations likely reflect an interaction between genetic predispositions and early auditory experiences, particularly musical exposure during critical periods of brain development.

Genetic studies further support a biological basis for AP. Heritability estimates reach up to 0.81, suggesting that genetics play a substantial role (Theusch & Gitschier, 2011). Research has identified regions on the long arm of chromosome eight (denoted as 8q24.21) associated with AP, including genes involved in memory and cognitive functions, reinforcing the link between AP and broader neurocognitive processes (DeSalle, 2018). Genetic studies have

indicated that perfect pitch runs in families, with a heritability estimate of 71%–80%. Nonetheless, genetic predisposition alone is not enough; early and intensive musical training is crucial for the manifestation.

Importantly, AP is not the inverse of congenital amusia, a condition characterized by difficulty perceiving pitch. While both involve pitch processing, they appear to have distinct neurobiological and genetic foundations. The specific genetic loci for amusia remain unidentified, indicating a separate etiology (Szyfter & Witt, 2020).

Prevalence of Absolute Pitch

Estimates suggest that the prevalence of AP in the general population is relatively low, with studies indicating that only about 1 in 10,000 individuals possesses this ability (Deutsch, 2013). However, the rate is significantly higher among musicians, particularly those with early and intensive musical training. Approximately 1 in 5 professional musicians is believed to have AP (Baharloo et al., 1998), with a higher prevalence noted among those who begin formal music education at a very young age. Interestingly, the ability is more common in cultures with tonal languages, such as Mandarin and Vietnamese, suggesting a potential interaction between linguistic and musical pitch processing.

These findings highlight that absolute pitch arises from a complex interplay of neuroanatomical specialization, functional brain connectivity, genetic factors, and early developmental influences. While it remains rare in the general population, its higher prevalence among individuals with specialized auditory training underscores the importance of both innate predispositions and environmental input in shaping this exceptional auditory ability.

Auditory memory and perfect pitch

In recent decades, the relationship between auditory memory and perfect pitch (AP) has become a key area of research, particularly in understanding how these cognitive abilities impact musicians' memorization and performance. Auditory memory refers to the ability to retain, recall, and process musical sounds, which allows musicians to internalize melodies, rhythms, and harmonies. On the other hand, AP is a rare ability to identify or produce a musical note without a reference tone. Interestingly, the *Enciclopèdia Catalana* defines perfect pitch as the ability to recall a musical frequency without any external reference, highlighting this close connection.

Emerging scientific evidence suggests a strong connection between the two abilities, with both being influenced by similar genetic and cognitive factors. Studies show that the same chromosome associated with the genetic predisposition for AP is linked to memory and cognitive abilities, reinforcing the idea of a direct relationship between auditory memory and perfect pitch (Deutsch, 2013). This intersection of auditory memory and perfect pitch may enhance a musician's capacity for more precise auditory perception and better retention of complex musical material.

Several studies have provided empirical support for the relationship between auditory memory and perfect pitch. Research by Baharloo (1998) found that individuals with perfect pitch performed significantly better on tasks related to auditory memory, such as recalling specific pitches and tonal sequences, compared to individuals without perfect pitch. This suggests that perfect pitch not only enables accurate pitch identification but also strengthens the memory capacity to store and retrieve auditory information. Interestingly, this relationship may have broader implications, as it underscores the potential for enhanced cognitive processing in musicians who possess this ability, possibly influencing their ability to handle complex musical structures and patterns.

Further, a study by Gelfand (2001) demonstrated that musicians with perfect pitch exhibited a greater capacity for memorizing melodies and identifying tonal errors. This ability is vital for musicians who often memorize music by ear or rely on auditory feedback for performance. The findings suggest that individuals with perfect pitch might not only have an edge in terms of memorization, but also in their ability to process musical information rapidly, which can lead to more intuitive and refined performances. Additionally, this refined auditory memory may allow for more accurate recognition of subtle tonal shifts or harmonic variations, enhancing the overall interpretive capability of musicians during live performances or recordings.

The connection between auditory memory and perfect pitch is supported by both cognitive and neural research. These abilities share similar underlying mechanisms, particularly in pitch processing and memory consolidation. Studies indicate that individuals with perfect pitch often exhibit advanced pitch discrimination, which facilitates their ability to retain and reproduce musical information with high fidelity (Deutsch, 2013). This heightened sensitivity to pitch enables musicians to encode and retrieve auditory information more efficiently, thus enhancing their memorization process.

Furthermore, the relationship between auditory memory and perfect pitch has profound implications for musical performance and memorization. Musicians with perfect pitch are often

more adept at memorizing melodies and identifying tonal inaccuracies, giving them a notable advantage in both live performances and the learning process. This ability to memorize music by ear and rely on auditory feedback is crucial for musicians who interpret and perform music from memory. Enhanced auditory memory helps them process complex musical passages with greater fluency, making it easier to recall and reproduce music with precision.

In summary, the empirical evidence reinforces the close relationship between auditory memory and perfect pitch, highlighting how both abilities are interrelated and contribute to musical expertise. By advancing our understanding of the neural and cognitive underpinnings of these abilities, we can better appreciate their impact on musicianship and the process of musical memorization.

Emotional and psychological aspects

Performing from memory goes far beyond mere technical proficiency; it deeply engages the emotional and psychological dimensions of the musician's experience. For musicians with perfect pitch (AP), memorizing and performing music without a score offers the opportunity to form a more intimate connection with the music. This connection is rooted in the enhanced perceptual abilities provided by perfect pitch, which allows individuals to identify and recall musical notes effortlessly, even without an external reference. These musicians possess a heightened sensitivity to pitch and tonal details, which, in turn, can make their performance more expressive and emotionally charged (Deutsch, 2013).

When performing from memory, musicians with perfect pitch experience a profound emotional connection to the piece, as they are no longer distracted by reading the score. The cognitive load associated with score reading is lifted, freeing up mental space to focus entirely on the music itself and its emotional content. This transition allows them to communicate their musical intentions with greater clarity and authenticity, deepening the emotional resonance of the performance (Juslin, 2015). Research has shown that the memorization process fosters this shift, as it redirects cognitive resources from technical execution to emotional expression, enhancing the overall quality of the performance. The ability to recall specific tones, rhythmic nuances, and harmonies without the score not only strengthens the emotional connection to the piece but also enables musicians to infuse their interpretations with greater sensitivity and subtlety.

However, the act of performing from memory is not without its challenges. Despite the advantages of heightened auditory memory, musicians with perfect pitch may still face performance anxiety. This is often rooted in the fear of memory lapses, especially when performing complex pieces without a safety net. Ginsborg (2004) notes that performance anxiety is common, even among musicians with exceptional memory skills, as the pressure of

delivering a flawless performance increases when there is no score to fall back on. For many, the emotional stakes are heightened when their ability to recall every detail of a musical work is directly tied to the public's perception of their technical and artistic competence. The anxiety stemming from this fear can sometimes diminish the overall experience, especially when there is a strong emotional investment in the accuracy of the performance.

From the audience's perspective, however, performances from memory are often perceived as more compelling and emotionally engaging. A significant body of research indicates that audiences tend to view musicians performing without sheet music as more authentic, spontaneous, and emotionally present (Williamon & Valentine, 2020). The absence of the score allows the performer to be visually "freer," and this perceived sense of freedom translates into a more intimate and impactful connection with the music. The audience is more likely to feel that the performer is fully immersed in the music, which enhances their emotional involvement with the performance.

The connection between auditory memory, perfect pitch, and emotional communication is also reflected in how music is perceived by listeners. Musicians with perfect pitch often have an extraordinary ability to recall complex tonal sequences, which makes their performances sound more polished and precise. The heightened sensitivity to pitch details that AP provides allows musicians to fine-tune their performance in ways that are not only technically accurate but also emotionally resonant. This precise auditory recall, paired with the ability to perform from memory, gives musicians a unique capacity to communicate their artistic intent with greater emotional clarity, enhancing the overall emotional impact of the performance (Deutsch, 2013).

In conclusion, the relationship between auditory memory, perfect pitch, and emotional engagement in performance underscores the dual importance of technical mastery and expressive depth in music. Musicians with perfect pitch, particularly those who perform from memory, have the ability to deliver performances that are not only accurate in terms of pitch and rhythm but also rich in emotional expression. The combination of enhanced auditory memory and emotional connection to the music allows these musicians to create performances that resonate deeply with their audience, making the act of performing from memory not just a technical achievement but a powerful means of emotional communication.

Historical insights

To ground the theoretical insights presented, this section highlights two historical figures, Clara Schumann, Franz Liszt and Wolfgang Amadeus Mozart, whose documented experiences with memory in performance offer valuable perspectives on auditory processing, memorization strategies and expressive interpretation.

Clara Schumann

Clara Schumann (1819–1896) was one of the first renowned pianists to consistently perform from memory, at a time when this was not yet a widespread or fully accepted practice. Her initial memorization was driven by practical constraints during her childhood tours, but it later became a deliberate artistic choice that helped elevate the status of the performer as an interpreter rather than a mere reproducer of the score (Reich, 1985; Davidson & Correia, 2002).

There's no evidence that Clara Schumann had absolute pitch, but her auditory acuity and memory were exceptional. She frequently performed extensive programs from memory, including complex works by composers such as Bach and Beethoven. Scholars suggest that her memorization strategies likely integrated procedural memory, auditory memory, and emotional memory, which reinforced her expressive interpretations (Ginsborg, 2004).

Her pioneering role contributed to reshaping performance norms and illustrated the artistic and cognitive potential of musical memorization. Clara Schumann's case exemplifies how integrated memory systems can support technical fluency and deepen interpretive insight.

Franz Liszt

Franz Liszt (1811–1886) was a revolutionary figure in the history of piano performance and one of the first to consistently perform full solo recitals entirely from memory. This was highly unusual in his time and became a signature of his public persona. Liszt's memorization practice was not only a display of his virtuosic skill but also a deliberate artistic strategy that allowed him to connect more freely and dramatically with the audience. His approach helped redefine the role of the performer as an interpreter and visionary artist, rather than merely a transmitter of the written score (Walker, 1983).

Liszt is widely believed to have had absolute pitch, which, combined with an extraordinary auditory memory, allowed him to internalize and reproduce music with remarkable precision. He was known for transcribing entire orchestral works for piano by ear and could recall and perform new compositions after a single hearing. These cognitive abilities - alongside his kinaesthetic and procedural memory - enabled him to shape his performances with exceptional fluidity and emotional depth (Deutsch, 2013; Levitin, 2006).

His influence marked a pivotal point in performance history. By memorizing repertoire and presenting it with theatrical and expressive intensity, Liszt established a new standard for concert performance and inspired future generations of pianists to adopt similar memorization practices as a symbol of mastery and interpretive authority.

Wolfgang Amadeus Mozart

Wolfgang Amadeus Mozart (1756–1791) is widely recognized as a prototypical case of absolute pitch (AP). Historical accounts suggest that by the age of seven, Mozart could precisely name and reproduce pitches after a single hearing (Deutsch, 2013). This extraordinary

auditory acuity was accompanied by an exceptional auditory memory, which enabled him to internalize and reproduce entire pieces with remarkable accuracy.

Mozart’s combination of absolute pitch and a highly developed auditory memory played a central role in his compositional and performance abilities. He was known to transcribe complex pieces after hearing them just once - for example, his well - documented transcription of Allegri's *Miserere* from memory after hearing it at the Sistine Chapel, where written copies were forbidden (Solomon, 1995). Such feats exemplify how AP and auditory memory may interact to facilitate near-effortless memorization and fluent performance in gifted individuals.

While absolute pitch alone does not guarantee superior musical memory, Mozart's case suggests that, in combination with cognitive and creative abilities, it can significantly enhance musical processing and memorization capacities from an early age (Levitin & Rogers, 2005).

Methodology

Having explored the theoretical and historical foundations of musical memorization and perfect pitch, this section outlines the methodological approach adopted to investigate these phenomena through a practical performance-based project.

Objectives

This research aims to explore the relationship between perfect pitch (AP) and the ability to memorize music, focusing on whether this ability is primarily innate or can be developed over time. The study investigates how auditory memory interacts with AP in the context of musical performance, and how these cognitive abilities might influence the performer's capacity to internalize and interpret music.

The central objective of the project is the preparation and public performance of a complete recital performed entirely from memory. This practical element serves both as an artistic challenge and a methodological tool to examine how memorization operates in the presence of AP, particularly from the performer's own experience. The project seeks to contribute to the broader understanding of how AP may affect not just technical accuracy, but also musical expressivity and emotional connection in performance without a score.

Research approach

Given the artistic nature of the subject, this study adopts a qualitative and practice-based research approach. The research integrates literature review, self-reflection, and the practical experience of preparing and performing a memorized recital. This methodology aligns with artistic research traditions, where the performer's perspective and embodied experience are central to the knowledge creation process.

Design of the study

The research is structured around two main components:

- **Theoretical framework**: A review of relevant literature on auditory memory, perfect pitch, and musical memorization. This includes neuroscientific studies, cognitive psychology, and music pedagogy sources.
- **Practical part**: Preparation and public performance of a full recital entirely from memory, consisting of:
    - *Hommage à Bach* – Béla Kovács
    - *Sonata No. 2 for Clarinet and Piano* – Johannes Brahms
    - *Fantasia da Concerto su motivi della Traviata* – Donato Lovreglio

Personal reflections, rehearsals, and performance experiences are used as qualitative data to explore the interaction between perfect pitch and memorization.

Materials and data collection

The main sources of data include:

- Scholarly literature and scientific articles related to AP and auditory memory.
- Reflective notes taken throughout the preparation process.
- Recordings and documentation of the final performance.
- Personal observations regarding ease of memorization, emotional connection, and performance confidence.

These materials allow for an introspective analysis grounded in both scientific knowledge and artistic insight.

Personal position

As the performer and researcher, I acknowledge my position as someone who possesses perfect pitch and finds musical memorization to occur naturally and effortlessly as far as we speak of tonal music. Rather than being a challenge, memorizing repertoire has consistently facilitated deeper emotional connection with the music and heightened interpretative expression. However, the memorization of more contemporary and atonal repertoires presents a distinct challenge. These compositions often lack the tonal centres or harmonic structures found in traditional classical music, which can make the process of memorization more difficult for me. The absence of predictable harmonic progressions and stable tonalities requires a different approach to memorization. Instead, I must focus more on patterns of rhythm, texture, and form, and develop a deeper understanding of the music's structure from a cognitive and analytical perspective.

I would like to highlight the fact that clarinettists most of the time are playing in Bb or A instruments and this is an extra challenge in terms of memorization and perfect pitch. In my case it gets to a point that your ear gets used to the sound colour of the different instruments and gets used to recognize the sounding notes based to this, like a relative pitch process, but being able to reach that point requires a lot of training and contact with the different instruments. For example, I noticed that during the first ten long notes I play every morning I'm hearing the notes in the last clarinet I played the day before, after ten notes my brain clicks and relocates to the correct tonality. However, in the exam concert the first solo piece is written for A clarinet and the other two for Bb.

This personal experience of differing challenges in memorizing tonal versus contemporary music informs my research and the focus of my recital. It provides insight into how different types of music may affect memorization processes in musicians with perfect pitch, and it helps clarify the possible factors that contribute to the development or limitation of memorization skills.

Ethical considerations and limitations

Given that this research is self-reflective and does not involve other participants, ethical concerns are minimal. However, there's the subjective nature of introspective analysis. This is addressed through transparency, documentation, and alignment with existing empirical studies for validation. While the research draws from a single case study, the goal is not to generalize, but to deepen understanding of the potential link between perfect pitch and memorization through a lived artistic process.

Discussion

In this section, we reflect on the preparation process for the exam concert, the strategies implemented for memorizing the repertoire, and the role of perfect pitch in this process. While the performance has not yet occurred, the following discussion will focus on the early observations, expectations, and potential challenges associated with memorizing the pieces.

Expectations and early observations

The repertoire for the recital includes a variety of musical styles, ranging from the tonal *Sonata for Clarinet and Piano No. 2* by Brahms to the *Hommage à Bach* by Kovacs, as well as *Fantasia from La Traviata* by Lovreglio. In terms of memorization, I have observed that pieces like Brahms' sonata and Traviata Fantasy, are naturally easier for me to memorize, my brain assimilates the music quickly and I'm hearing the names of the notes while playing. The ability to instantly recognize and recall pitches without a reference tone provides a strong foundation for memorizing harmonic progressions and melodic structures. The piece's tonal stability allows me to rely heavily on perfect pitch and auditory memory to internalize the music.

On the other hand, *Hommage à Bach* presents a different challenge, not due to atonality, but because of its solo clarinet format and I am not used to this. The piece is firmly rooted in a tonal centre and relies on Baroque style, including sequences, arpeggiated figures, and contrapuntal textures. While the perfect pitch helps in identifying and internalizing the tonal structures, the absence of harmonic support, such as a piano or orchestral accompaniment, initially seemed to make the memorization process more difficult. Unlike ensemble settings where harmonic cues aid navigation and recall, performing solo requires a more self-reliant approach, where I must construct the harmonic context internally.

An interesting realization occurred during my work with *Hommage à Bach*. Until this point, I had believed that solo clarinet music was inherently harder for me to memorize because of the lack of harmonic grounding provided by accompanying instruments. However, through preparing this piece, I discovered that it was not the absence of harmonic support that posed the real difficulty, but rather my unfamiliarity with managing long-form solo works independently. In fact, the clear tonal framework and logical structure of the piece, reminiscent of Bach's compositional style, eventually made the memorization feel quite natural. This shift in understanding allowed me to reframe my approach and appreciate how tonal clarity, even in unaccompanied music, can serve as a reliable scaffold for memory.

Cognitive and emotional dimensions of memorization

As I move through the memorization process, I am becoming increasingly aware of the emotional and cognitive dimensions of memorizing and performing music from memory. For the accompanied pieces, memorization feels almost instinctive, and it allows me to engage more fully with the expressive elements of the music. Without the constraint of reading from a

score, I feel freer to explore phrasing, dynamics, and emotional nuances, which enhance my connection to the music. This deeper engagement is consistent with existing research that suggests memorized performances foster stronger emotional connections to the music, as it was mentioned before.

However, since I have never performed a solo clarinet piece from memory before, there is a slight sense of uncertainty associated with this experience. While I do not find memorizing tonal music particularly challenging, the absence of harmonic and not harmonic accompaniment in *Hommage à Bach* initially made me question whether memorizing a solo work would feel more exposed. Surprisingly, I found the piece's tonal clarity and baroque-inspired structure to be helpful anchors in the memorization process. Rather than feeling unsettled, I experienced a growing sense of ease and confidence as I worked through the piece. This process has allowed me to connect with the music on a deeper level, appreciating its internal logic and expressive potential without relying on external harmonic references.

Role of perfect pitch in musical memorization

Perfect pitch plays a pivotal role in the memorization of tonal music. In the case of Brahms' *Sonata for Clarinet and Piano No. 2*, having AP and a fast auditory memory helps streamline the memorization process, allowing me to focus on the larger musical structures rather than individual notes. This ability has a big impact on my memory accuracy and retention of the music.

For the atonal pieces, however, perfect pitch has proven less advantageous. While I can identify individual notes more quickly, the lack of tonal reference requires a shift in how I memorize the music. Instead of focusing on pitch alone, I rely more on muscular memory, patterns, and the overall structure of the music. This experience aligns with the research suggesting that perfect pitch aids in tonal memory but has a limited effect on the memorization of atonal or contemporary music (Deutsch, 2013).

Anticipated challenges and strategies

As the exam concert approaches, I anticipate that the greatest challenge may lie in the overall duration and stamina required to perform an entire recital from memory. Although memorizing tonal music feels natural to me and has progressed steadily, the sustained concentration needed to maintain accuracy and expressive depth throughout a long program presents a new kind of mental and physical demand. This includes managing transitions between contrasting pieces, such as the lyrical and dense Brahms Sonata, the virtuosic demands of the Traviata Fantasy, and the stylistic clarity needed in Hommage à Bach. While none of these pieces pose significant memorization difficulties individually, maintaining focus across the complete program without the visual aid of the score requires a high level of preparation. To address this, I am integrating regular full run-throughs, mental practice sessions, and physical conditioning into my preparation to ensure I can deliver a consistent and emotionally engaging performance from beginning to end. One of the techniques I am working with lately is starting to build the pieces from the end to the beginning ensuring the sound quality and also ensuring that the pieces are fully internalized in terms of memorization.

Results

After having done the exam concert, I will share the result of it. While not all pieces were performed entirely from memory, the experience provided valuable insights into the effectiveness of memorization strategies and the interaction between auditory memory, muscular memory, and performance practice.

- Brahms Sonata for Clarinet and Piano No. 2: this piece was performed with the score, as I decided at the last moment that the level of rehearsal with the pianist was insufficient to ensure a confident fully memorized performance. Despite using the score, prior memorization of the work facilitated better communication and coordination with the pianist, allowing me to anticipate phrasing and entrances. This resulted in a performance that was more coherent and musically secure than if I had relied solely on sight-reading.
- Fantasia from La Traviata by Lovreglio and Hommage à Bach by Kovacs: both pieces were performed entirely from memory and without any memorization-related incidents. In the Traviata Fantasy, a minor coordination issue arose near the end, as the accompaniment slightly anticipated my part. However, due to the thorough internalization of the piece, I was able to recover seamlessly, maintaining musical continuity and expressive control. Hommage à Bach, although initially challenging due to its solo clarinet format, was a good and relaxing opening for its musical colours and harmonies.

Critical reflection on the exam concert

Reflecting critically on the recital result, several important insights emerge regarding musical memorization, absolute pitch, and performance practice:

- Decision-making under practical constraints: choosing to perform the Brahms Sonata with the score illustrates that memorization must be balanced with rehearsal time and coordination with the other musicians. Even partial memorization, however, improved communication with the pianist, enhancing phrasing and interpretative cohesion. When you know deeper the repertoire you can focus in other aspects of the interpretation.
- Solo performance challenges: Hommage à Bach initially posed a psychological challenge due to its unaccompanied format. This experience highlighted that familiarity with structure and internalized harmonic frameworks, supported by absolute pitch, can compensate for the absence of external harmonic reference, enabling secure and confident solo performance. Also, the psychological factor of feeling in control of the situation and knowing that in case of getting lost you have enough tools to improve on the harmonies and redirect the performance can really help. This last insight wouldn't work for auditions or competitions but it will in a concert situation.
- Managing unexpected incidents: during the Traviata Fantasy, the minor timing discrepancy with the accompaniment demonstrated that thorough memorization provides the flexibility and confidence to recover in real time, maintaining musical

continuity and expressive control. Knowing exactly which harmonies are sounding in the accompaniment, recognize that something is happening and be able to react it can be a big advantage, although it's complicated because you never predict this kind of fast reactions.

- Cognitive and emotional dimensions: memorization enhanced expressive freedom and focus on phrasing, dynamics, and musical dialogue. Absolute pitch facilitated rapid note recognition and structural mapping in tonal works, while atonal or rhythmically complex sections required greater reliance on muscular memory and pattern recognition.
- Learning outcomes: this reflective process emphasizes that memorization is a holistic skill, integrating auditory perception, muscular memory, cognitive mapping, and emotional engagement. It underscores the interaction between innate abilities, experience, and psychological readiness in achieving a confident and expressive performance from memory.

In summary, this reflection bridges the descriptive observations from the exam concert with broader theoretical and pedagogical considerations, preparing the ground for the Conclusions, where these insights are synthesized and connected to the central research questions of the project.

Conclusions

This research project has explored the relationship between auditory memory and perfect pitch, with a particular focus on their roles in musical memorization. Through an analysis of scientific literature and reflection on my own experience preparing for the final master's recital, it becomes evident that while perfect pitch and strong auditory memory provide clear advantages, they do not eliminate the broader challenges of performance preparation.

One key insight is that tonal music poses little difficulty for me in terms of memorization, likely due to the interaction between auditory memory and perfect pitch. Repertoire such as the Brahms Second Sonata and Fantasia on Themes from La Traviata has felt intuitive to internalize, and the process of learning them by heart has progressed naturally. In these cases, perfect pitch allows me to form a precise and detailed internal representation of each piece, making it easier to recall and navigate the structure during performance.

The piece that has prompted the most reflection is Hommage à Bach. Despite being a solo piece, it is grounded in a clear tonal centre and influenced by baroque idioms, and contrary to my hypothesis because of being a solo clarinet work without harmonic support, I've seen that's not an impediment. Having previously always memorized music in orchestras, ensemble or piano-accompanied settings, I initially believed that the lack of external harmonic grounding would complicate memorization. However, through the preparation process, I realized that the harmonic independence of Hommage à Bach was not a true obstacle. Instead, the unfamiliarity with performing unaccompanied works from memory presented a new psychological dimension to the process.

As I prepare for the exam concert, the most significant challenge lies in the overall duration of the recital and maintaining high focus throughout all three demanding works. This extended performance requires sustained mental energy and resilience, especially for ensuring that all pieces remain fully assimilated in terms of memorization. To meet this challenge, I continue to apply various memorization strategies, combining auditory, structural, and kinaesthetic cues, as well as regular mental rehearsal.

To conclude, this project highlights that while innate abilities such as perfect pitch may facilitate musical memorization, successful performance from memory involves a broader interplay of experience, repertoire familiarity, and psychological readiness. Reflecting on my own process has also helped clarify that the sense of connection and expressiveness I experience when performing from memory is deeply rewarding. Ultimately, memorization enhances not only technical fluency but also emotional depth, allowing me to communicate more directly with my audience.

Future directions in research

Future research should further investigate how absolute pitch interacts with instrumental practice, particularly in the context of transposing instruments. Musicians with absolute pitch may face unique cognitive challenges when required to transpose music mentally, as their fixed pitch references can interfere with relative pitch processing. Neurocognitive studies could

provide insight into the mechanisms of this interference and how it impacts memorization and performance accuracy.

From a pedagogical perspective, it is essential to explore how educators can better support students with absolute pitch, fostering flexibility in pitch perception and enhancing their ability to perform across diverse instrumental contexts. In parallel, greater emphasis should be placed on teaching and encouraging performance by memory ("by heart"), not only as a skill for professional performance but also as a tool to deepen musical understanding and expression. Training strategies that integrate memory development, aural skills, and interpretation may prove beneficial in helping musicians internalize repertoire more effectively and connect more deeply with audiences.

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