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Effects on Semantic Memory for Performers of Emotionally Expressive Music

Nathan Ahn
nathan@weahns.net

ABSTRACT

This paper explores the influence of emotionally expressive music on the semantic memory system. Music has long been associated with memory systems, with the emotional aspect of musical representations often being the defining characteristic that makes it meaningful and vivid in memory. Despite extensive research linking musical stimuli to various memory systems, the connection between music performance and the semantic memory system remains underexplored. This paper employs a transdisciplinary literature review to investigate the potential benefits of emotionally expressive music for semantic memory. The literature was largely searched in databases including Harvard Library HOLLIS and Google Scholar, using Boolean operators and filtered by peer review, recency, and relevance. Research indicates a promising link between semantic encoding and the retrieval of induced emotions, suggesting that the emotional component of music-making may substantially impact memory consolidation. The review highlights an abundance of studies on music perception, with fewer robust findings on the effects of music-making. Synthesizing across these domains suggests the emotional, not merely technical, component of performance may be what recruits semantic processing. This review suggests the performer, not only the listener, may benefit semantically from emotionally expressive music, and identifies the possibility of a direct performance-semantic memory link as a key gap for future research.

INTRODUCTION

Memories and experiences are what shape human life, forming the backbone of our identity, decisions, and relationships (Madan, 2023). Yet, the experiences that are truly vivid and salient in the mind are those associated with music, which is categorized as a series of sounds or soundscapes that evoke meaning and emotion by eliciting strong emotional memories (Salakka et al., 2021; Vuust et al., 2022). Music is historically foundational to human society, being preserved throughout generations across the globe (e.g. White, 1996). Through diverse phrasings and timing, music can become more expressive and meaningful to select perceivers, features that closely resemble the diverse tones and durations involved in speech (Haiduk & Fitch, 2022). While the technical aspects of music are vital to shaping the music experience, it is often the emotional expression that captivates listeners and gives music its human dimension (Juslin et al., 2015). This is known as expressive musicality, in which the emotional connotation of a piece is personified and engendered through the musician's unique interpretation (Jiang, 2025). Extensive research also highlights the emotional component of music, with both therapeutic and cognitive benefits, and further suggests an association among music, emotion, and health (Yinger & Gooding, 2014).

The emotional role of music has been researched for decades; since the origins of music, it has served as a prevalent means of communication through rhythmic patterns and pitches across populations (Killin, 2018; Mishra & Shastri, 2021). Music serves as a vessel for emotional expression, often used in storytelling through lyrics and visual media, and some even wield the capability to bridge differences on highly polarized topics (Abebe, 2021). These bonds, fostered by music, Abebe suggests, are stored in semantic memory — a subsystem of long-term memory that organizes general knowledge and supports higher cognitive functions, such as creative thinking (Denervaud et al., 2021). This link is reinforced by research showing the significant contributions that semantic memory makes to understanding and recognizing emotions (e.g., Macoir et al., 2019). It is important to note that the semantic memory system depends in part on schemata, mental frameworks that help categorize and interpret information (Eysenck, 2020). Additionally, Toledo and colleagues (2024) suggest music perception can enhance emotional memory: the recollection of memories associated with strong emotions. For the purposes of this paper, a clear distinction between music perception and music performance must be established. Music performance uses musical notes as a medium to modulate and convey emotions, whereas music perception is the individual interpretation of the product (Yang et al., 2023). Research on the mental and emotional influence of expressive music on the musicians themselves is scarce, only being brought to notable attention in musicology, the study of music, in the past several years (e.g. Ayob & Jia, 2025; Ghvinjilia, 2025).

Although this area of study is relatively new, emerging research suggests that music training shows promise in enhancing various memory systems and higher cognitive functions (e.g., Sofologi et al., 2022; Toader et al., 2023). Both the intentional (explicit) and unconscious (implicit) memory systems are thought to play vital roles in instrumental music performance and practice, and to strengthen episodic memory, a branch of the long-term memory system (Cournoyer Lemaire, 2019; Heath, 2025). Considering the obscurity of the semantic-episodic continuum (Bontkes et al., 2025), such relations in music making logically suggest a plausible association with semantic memory. This raises the question of whether performing emotionally expressive music enhances musicians' semantic memory. Although semantic memory has been linked to music perception, memory systems, emotional processing, and emotional memory, its development through musical expression and its implications for semantic applications remain unexplored, revealing a perceived gap in the literature.

Background

Previous studies have established that expressive musicality can elicit a strong emotional response in listeners, tapping into their episodic memories (Juslin et al., 2015). Vuust and colleagues (2022) emphasized music's ability to evoke strong emotional memories, leading the perceiver to assign meaning and depth to auditory stimuli. In fact, the musical expression of emotions has been a fundamental aspect of music since its inception, as evidenced by modern musical representations (Killin, 2018). One such case is the personification of emotional and expressive music in the blues, which originated in African American communities during the Jim Crow era. Renowned artists like Etta James describe singing the blues as "singing life," as the songs' content primarily reflected the communal afflictions the minority faced (Pimental et al., 2022, p. 1). Even heavy metal music, often clouded with concerns of increasing risks of aggression and depression, was revealed to show a correlation with improved mood and identity formation for individuals who considered themselves fans of the genre (Olsen et al., 2022). As auditory stimuli are explored in modern applications through the visualization of lyrics in music videos, it is evident that music remains a major medium for the narration and conveyance of ideas and desires (Abebe, 2021). Semantic memory, the system that stores general knowledge of the world, is strongly associated with emotional understanding, as supported by extensive research (e.g., Macoir et al., 2019). Eskine and her colleagues (2018) found that retrieving semantic information increased recognition of similar patterns in rhythm, melody, and harmony. Although music-related skills may have already been explored in the realm of memory systems, the factor and influence of emotional intent are lacking in these studies. The literature defines music perception as a passive process and music performance as an active engagement of emotional regulation (Yang et al., 2023).

Empirical observations have consistently supported growth in various memory systems as a means of promoting music education (e.g., Heath, 2025). Heath explains that musical performances and practice both play vital roles in the shaping of the explicit and implicit memory systems. Musical training was also associated with enhanced foreign language acquisition among musical professionals, suggesting improvements in long-term memory involved in assimilating new words (Dittinger et al., 2021). Moreover, a study by Cheng and colleagues (2022) found evidence of plasticity and white matter growth in the brain's emotional and linguistic networks during long-term musical training. His research suggests a positive correlation between music training and the myelination of emotion-associated neural networks, in addition to those networks in episodic memory systems. All these studies suggest that further research in this area could yield real-world applications in which music serves as a leading medium for neural development. At the intersection of these topics lies the possibility that emotional transmission through music directly enhances the performers' semantic memory network.

The Problem

While there is consolidated evidence from multiple methods that validates the connection between musical stimuli, there is far less evidence regarding musical performance, especially regarding emotional factors, as suggested by Fennell and colleagues (2021). Many of these studies, including Fennell's, prioritize music perception over music performance, emphasizing listening over the emotional performance component of the interaction. Even fMRI studies that explore changes in performers often hyperfocus on motor skills or resting-state functionality rather than the emotive impetus of most musical expression (e.g., Acer et al., 2024; Xue et al., 2026). There must be limitations that make monitoring a performer's emotional interpretation and transmission improbable. For instance, Macoir and his colleagues (2019) suggest that semantic memory aids emotion recognition, but the study does not clarify whether engaging in emotional activities, such as expressive musical performance, can strengthen semantic memory in turn. The study by Eskine and colleagues (2018) on the semantic retrieval of technical musical elements (e.g. harmony) has similar ambiguities. Both instances view the relationship between semantic memory and emotions unidirectionally, leaving the inverse relationship unclear. Another major area of literature on music explores psychological influences and the impact of music therapy, yet the same limitation of being confined by musical perception persists (Fennell et al., 2021). The only major neural investigation in performer emotions notably apparent in scientific literature boils down to performance anxiety (e.g. Kinney et al., 2025; Viator et al., 2024; Gómez-López & Sánchez-Cabrero, 2023). While the links between (a) expressive musicality and emotion, (b) emotion and semantic memory, and (c) semantic memory and expressive musicality have been examined by ample research, there is far less understanding in the intersection of the three, which is why a transdisciplinary approach was used to analyze the published literature in this field of research. Establishing this link is important because it would reposition the performer, not only the listener, as a beneficiary of music's cognitive effects, with potential relevance to music education, therapy, and language learning, where emotional engagement could be deliberately leveraged.

Research Question

To address the perceived gap in the literature, this paper will examine how and to what extent musicians' ability to perform emotionally expressive music enhances semantic memory. The review is limited to emotional expression conveyed primarily through instrumental and vocal performances rather than digital or visual media. It considers musicians of all levels and ages while encompassing both positive and negative emotional expression. No existing study directly isolates emotionally expressive performance from semantic memory, so the answer is necessarily built inferentially, converging evidence from the perspectives of neuroscience, musicology, emotion, and memory research.

METHODS

This paper is a transdisciplinary literature review across psychology, neuroscience, mental health, emotional interpretation, and education to understand the relationship between expressive musicality and the performer's semantic memory system. Thorough research was conducted on published empirical studies, peer-reviewed articles, and systematic reviews using Google Scholar, the Harvard HOLLIS system, and other databases, including JSTOR, PubMed, and APA PsycInfo. Four Cartesian sets were used to conduct research for this paper. The first set included the terms "expressive musicality," "expressive music," "communicative music," "emotional music," "music performance," and "music." The second set included "emotion," "emotional communication," and "emotional expression." The third set included "semantic memory," "emotional memory," "long-term memory," "schematic memory," "neural correlates," and "memory." The final set included "music education," "music training," "novice musician," and "professional musician." The review of this topic aimed to strengthen the motives for musical expression and to introduce the possibility of nonmusical benefits in passionate emotional music-making. All age groups of musicians were included, along with consideration of both positive and negative emotional expression.

One procedure used to gather relevant literature was the snowball method. It involved using the "related articles" section under sources on Google Scholar and directly examining the cited references in the appropriate literature. For instance, peer-reviewed articles published between 2021 and 2026 were preferred, with the exception being foundational constructs used in modern studies (e.g. Lang, 1979) and empirical observations unaffected by modern neuroscientific discoveries (e.g. Karlsson & Juslin, 2008). All ages and genders were included in the research. All studies reviewed for this paper were either published or translated into English. Studies without English versions were excluded to avoid potential misinterpretation of the text. A variety of music genres were considered, though the review largely focused on emotional expressions conveyed through instrumental and vocal means. For each source, the author(s), publication year, study design, and sample, the memory or emotion system examined, and the central finding were recorded and sorted into one of the three thematic categories used in the review.

Findings were combined using narrative thematic synthesis: studies were first organized into three categories (music and emotion, emotion and semantic memory, and music and semantic memory), then cross-read to identify recurring themes that cut across categories, which form the basis of the discussion section of this paper. Study quality was screened informally rather than with a standardized appraisal tool, so sources were retained based on peer-review status, methodological transparency (e.g., reported sample, design, and measures), and topical relevance, with the content and relevance of the articles being considered paramount. Despite the emphasis on relevance, outdated research or technology was vigilantly avoided. No formal Risk of Bias tool was applied, which is a limitation revisited later for small samples in several of the included studies.

RESULTS

In order to respond to the research question "How and to what extent does the musicians' ability to perform emotionally expressive music enhance semantic memory?", the literature is divided into three main categories: (a) Music and Emotions, alongside two subtopics of emotional communication and music education, (b) Emotions and Semantic Memory, and (c) Music and Semantic Memory.

Music and Emotion

Humans all have a biological understanding of musicality (Bowling, 2023). Stemming from that innate musicality may lie the link between music and emotions that has existed since music's evolutionary origins as a means of communication and social bonding (Savage et al., 2021). The analysis of music and the associated emotions will be sorted into two subtopics: music education and emotional communication.

It will distinguish the pedagogical presentation of music in academic environments from its aspects in communicative emotional transmission.

Music Education

Emotion modulation is an integral step in music training, often described as a key skill that differentiates professional musicians from amateurs (Jiang, 2025). An empirical study by Karlsson and Juslin (2008) investigated how musicians are taught to express emotions, focusing on instrumental music instruction. The study involved video-filming lessons featuring five teachers, aged 30-70 (M = 50.4), with teaching experience ranging from 3 to 40 years, and 12 students, aged 15-35, with music experience ranging from 3 to 22 years, then using the footage to transcribe and analyze the content of feedback and language used. The results showed that a large portion of lessons were dominated by talk, with teachers primarily conversing. The lesson primarily focused on the technical details in the score, making its focus strikingly similar across various teachers. Learning musical expression, on the other hand, involved students listening to examples or performances by other musicians. For instance, teachers commonly asked students to imagine a color that would associate well with the piece. These interactions between the student and teacher suggest that intonation and correct articulation are fundamental skills that allow the interweaving of overarching emotions that complete the musical expression.

Karlsson and colleagues observed that the emotional element in the music-making was emphasized implicitly rather than as an explicit goal. The authors found that teachers rarely addressed words that explicitly conveyed the idea of expression, such as emotional, expression, and interpretation; instead, teachers often used metaphorical language, using colorful yet vague descriptions to convey the feeling of the piece (Karlsson et al., 2008, p. 319). The study reveals that the expressive aspect of music is not explicitly taught by instructors and is instead left to the student’s interpretation. The technical elements taught play a critical role in how the music is expressed, significantly influencing students’ musical interpretation.

Emotional Communication

There is extensive evidence that demonstrates the emotional communicative functions embedded in music (e.g. Peretz, 2015). One example can be found in the retrospective observational documentary on the African talking drums, a complex substitutory communication system that relies on distinct auditory cues and patterns (Carrington, 1971). These drums accurately conveyed emotional information by leveraging neural overlaps between music and language processing, highlighting music’s similarities to language processing. Carrington delves into the drum language, also known in Congo as the gong language. Fundamentally, there are the “tones of voice” in the language of the drum, where there are two tones: one low and one high (Carrington, 1971, p.92). A sequence of these drummed tones is combined to create a symbolic representation of objects and concepts. Notably, these tones are not used like vowels or consonants, but rather mimic the tones used in frequent phrases in speech. In the Gong language, phrase accents distinguish ideas from one another. For instance, in the case of “firewood” and “little bits of firewood," the tone of the words helps the Gong language distinguish between them (Carrington, 1971, p. 92). The melody and stereotypical articulation that are internally elicited give musical language meaning, and without them, the message becomes indecipherable, making mechanical representation stand in stark contrast to feeling-imbued conveyance. This distinction highlights the stark contrast between a mechanical, expressionless sound and an ardent, evocative representation of music, suggesting defining characteristics that differentiate the two categories of musical interpretation.

Izen and colleagues (2023) suggest that the depth of engagement expressed through the tonal qualities of music is far more diverse across individuals and cultures than can be conveyed through ordinary verbal communication, emphasizing the potential of music for more dynamic and diverse emotional exchange. In the study, neural networks underlying music-making were captured using neuroimaging technologies, including but not limited to electroencephalography (EEG), functional magnetic resonance imaging (fMRI), electrocorticography, and functional near-infrared spectroscopy. Izen and colleagues tracked brain activity during individual and synchronized playing of musical instruments, yielding scans suggesting that synchronous playing has a distinct neural profile from individual musical expression. Their study also highlighted complex cognitive, social, and emotional processes required in joint performances, especially in instrumental settings. It provided evidence of hierarchical processing of music from the primary auditory cortex to higher-order brain regions (Ren & Brown, 2024). The organization of sound elements across multiple nested timescales into larger, more complex structures has been observed not only in humans but also in distant species, including primates such as orcas and select bird species (Yadav et al., 2024). These studies are part of the wider exploration of the interplay between music and communication, and they bring language into the fold of musical auditory phenomena. In fact, Turker and Reiterer (2021) also found significant neural overlap between language aptitude and music skills, with musicality showing notable associations with foreign language learning in the field of phonetic acquisition, strengthening the case for the aforementioned studies. They collectively suggest how music perception may transcend language in more emotional, social, and naturalistic facets (e.g. Izen et al., 2023), providing a unique perspective to communication throughout the animal world that is largely overlooked in language research.

Differences in neural activity between neutral performance and emotional performances of music have also been observed in recent years. In a study conducted by Ghodousi and colleagues (2022), ten pianists (two male, eight females) with at least five years of musical experience were instructed to play a piece neutral in expression and the other abundantly emotional, each time using any expressive cues to modulate one of five emotions picked according to a model that categorizes emotions based on valence and activation (distressed, excited, depressed, relaxed, neutral). A total of 200 trials were recorded with each participant. For each trial, EEG signals at different frequencies were recorded using electrodes to measure brain activity during participants' various performances. The EEG signal frequencies ranged from low-frequency bands (alpha, theta, delta) to high-frequency bands (beta and gamma). EEG results showed considerable differences between neutral and emotional play in arousal and activation levels. Not only were prefrontal cortex regions more active in professional participants improvising in response to emotional cues, but the left hemisphere also showed predominant activity, a region often associated with language processing. Furthermore, analysis indicated that semantic processes were most likely heightened during emotional reflection and performance.

Figure 1 below, from the study, shows node connectivity plots of the brain for each trial, illustrating the unique networks and connections present for each emotion and non-emotion, with varying activity strengths. The color coding of the nodes and connections represents various brain regions, while node size indicates degree. The thickness of the lines reflected the strength of the connections between brain regions. The study presents a visual representation of how conveying emotions in musical expression can lead to contrasting neural network activity, even when subjects performed the same piece of music with intentionally neutral emotions.

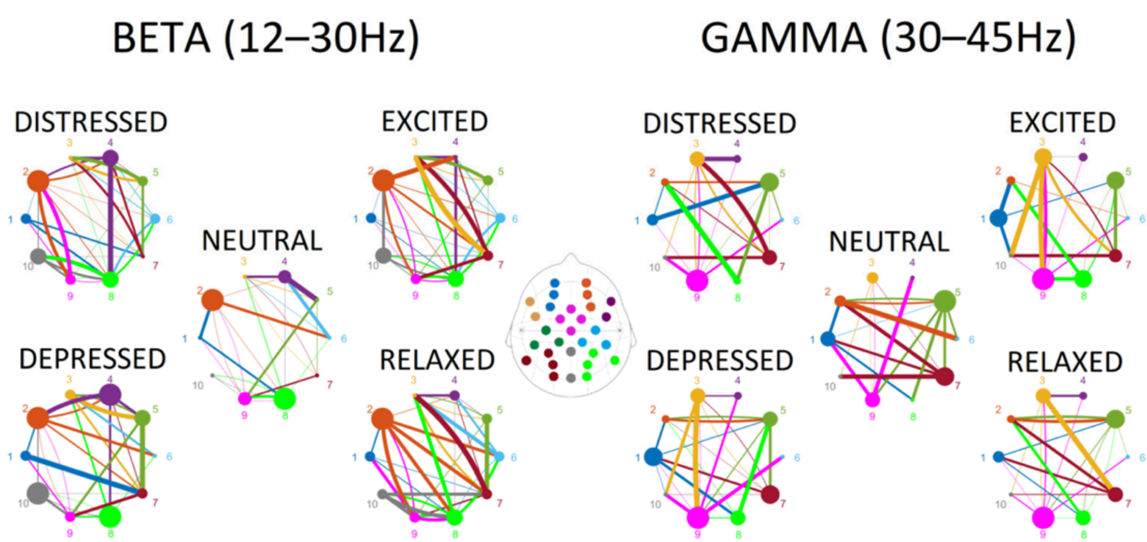

Figure 1: EEG Connectivity Plots of the Brain During Various Emotional Performances | *Note:* The connectivity plots are from the beta and gamma frequency ranges of the five experimental conditions. The circles at the edges of all ten circular diagrams each represent a region of the brain, color-coded to match the brain diagram in the middle of the graphic. From "EEG Connectivity During Active Emotional Musical Performance," by M. Ghodousi, J.E. Pousson, A. Voicikas, V. Bernhofs, E. Pipinis, P. Tarailis, L. Burmistrova, Y.P. Lin, and I. Griškova-Bulanova, 2022, *Sensors, 22*(11), p. 8 (https://doi.org/10.3390/s22114064). Copyright 2022 by the authors. Used with permission from the authors.

Ghodousi and colleagues' study can be used to further support the differences between neutral and emotional expression in musical communication. Transmitting emotions through music completely changes the connections and activations in brain regions, showing that the induction of emotions is not simply a variation in the music but a distinct neural experience. The intentional modulation of emotions during a musical performance seems not only to cause distinguishable neural activity but also to involve additional semantic processing in the frontal cortex in the expression of emotions.

Emotion and Semantic Memory

Since the inception of neural network theories, emotions and semantic activity have been linked together (Storbeck, 2022). One idea that stems from this relationship is the association of induced emotions and semantic memory retrieval, studied by Jiang and colleagues (2021). A total of 57 healthy participants (44 females and 13 males) with an average age of 22.53 were randomly assigned into three groups: a positive, a negative, and a neutral group. To test encoding and retrieval capabilities and the influence of induced emotions, participants first confirmed their familiarity with geographical names in Africa and South America, which served as the semantic knowledge they had to encode and retrieve. The experiment began with a familiarity check, followed by an emotion check to establish the participant's baseline emotion. Next, emotions were induced through video and background music. The positive group was shown videos of adorable infants accompanied by upbeat music, while the negative group was shown children living in war, accompanied by music that evoked sadness and melancholy. After ensuring that the emotion was induced in the participant, they encoded the geographical names while the background emotional music corresponding to the video being played. Participants were asked to recall the information, with answer choices being "right" (successful in recognizing presented geographical information as encoded or new), "not sure" (unable to distinguish if information was encoded or new), and "wrong" (failure to recognize presented information as encoded or new). Emotion checks 3 and 4 ensured that the induced emotion was present throughout the experiment. The results of the experiment indicated that the highest average number of correct answers was in the positive group, followed by the neutral group, and the lowest average was in the negative group. The difference between the groups was marginal in the incorrect-answer category, but all effects were statistically significant at a $p < .05$ level. The influence of the induced emotions was most evident among participants who clicked the "not sure" button, with the time they took to click the button strongly dependent on the induced emotion. The study demonstrated that positive induced emotions enhance semantic memory encoding and retrieval, strengthening the relationship between emotions and semantic encoding and retrieval.

Another approach to the linkage between emotions and semantic memory was through the bioinformational theory of emotional imagery, a hypothetical model created 40 years ago by Lang (1979), which suggested that mental images are stored in long-term memory. Renowned in the field of psychology, Dr. Peter John Lang has received countless awards throughout his career, with his development of the bioinformational theory of emotional imagery being a central framework for clinical psychological treatments for over 45 years. To further explore this foundational concept, Bradley and colleagues (2023) used modern neuroimaging techniques to investigate the associations among emotional narrative imagery, memory networks (episodic and semantic), and physical bodily responses. In the study, fMRI scans of participants engaged in emotional imagery showed heightened activity in the lateral cerebellum, vermis, and caudate, brain regions that play a crucial role in movement and coordination. Activation of these regions was associated with finger tapping and foot flexion, but activity occurred when simply imagining these activities, suggesting the triggering cue is not physical, but rather emotional. In addition, emotional imagery caused significant activity in the ventrolateral prefrontal cortex (VLPFC), involved with working memory and language processing; the dorsomedial prefrontal cortex (DMPFC), involved with emotion regulation; the anterior hippocampus, involved with memory formation and retrieval; and the posterior cingulate cortex (PCC), a core region for autobiographical memory. The study showed that emotional imagery not only activates regions involved in memory retrieval and emotion regulation (anterior hippocampus & DMPFC) but also reveals an association between imagery and motor control (cerebellum and caudate). Given that major brain regions associated with semantic processing are primarily distributed in the temporal and frontal lobes, including the hippocampus, PCC, and neighboring medial temporal lobe structures, the scans strengthen the case for a link between emotions and semantic memory.

In addition, Macoir and colleagues' (2021) investigation into how prior semantic knowledge affects music recognition and interpretation reveals a further interconnection between emotion recognition and semantic processing. Macoir and colleagues sought to assess the influence of semantic knowledge on emotion recognition by comparing 32 control participants with 9 individuals with the semantic variant of primary progressive aphasia (svPPA), a degenerative disorder characterized by semantic impairment that notably preserves other cognitive abilities in the primary stages of the disease. This syndrome enabled Macoir to test the discrepancies in emotion recognition with a reliable clinical model of isolated loss of semantic knowledge. The medium through which emotions were presented to the participants was through music, allowing Macoir and his team to investigate the three core aspects: the ability to a) recognize music excerpts in terms of familiarity, b) associate semantic concepts to the music stimulus, and c) identify basic emotions conveyed in the music. The results from the experiment showed that participants with svPPA were spared from the ability to recognize familiar music; however, they demonstrated impaired performance on the other two abilities when compared to the control group. Macoir concluded that semantic memory plays a pivotal role in placing meaning in the music and recognizing the emotional intent behind it. The findings suggest an underlying association between semantic knowledge and the ability to understand and recognize emotions in music, forming a convincing case that underscores the importance of the mind's semantic foundation, even for relatively subjective and emotional experiences of melodic soundscapes.

Music and Semantic Memory

Music is closely linked to semantic memory, as elements of a performance, such as sound, tonality, and pitch, are stored in the semantic memory system (Heath, 2025). Jimenez and colleagues' (2022) study explores the link between schematic memory and veridical memory, which are specific experiences that the individual hears or sees, and harmony familiarity through music perception. An online experiment was used to gather data for this study. The study included 60 males and 59 females, with a mean age of 42.44 and a standard deviation of 11.29. 34.2% of participants had no instrumental experience, 25.8% had less than 5 years of experience, and 40.0% had more than 5 years of experience. Participants were directed to rate the match of a harmonic chord to the vocals of popular Western music between three types: the original chord, labeled the target; a plausible but different chord, labeled as the lure; and a clashing, dissonant chord. In addition, two conditions were set in place, with one only having the test chord, while the other was presented in its harmonic context.

The results of the experiment showed that most participants rated the target chord highest, followed by the lure, while the clash chords were rated lowest. Jimenez and colleagues suggested that the schematic memory system was involved in participants' judgments when the full musical context was provided, allowing them to draw on their musical experience to associate the harmony with a specific schema. On the contrary, when the chord was introduced unassisted, veridical memory played a larger role in recognition due to the absence of a musical context. This study demonstrates that the schematic memory system, closely associated with the semantic memory system, stores musical knowledge, enabling people to discern harmonic music. In summary, the literature suggests that the musical endeavor of emotional expression engages the semantic memory system not only as a repository of musical knowledge of tonality, pitch, or technical skill, but also as a vital system involved in interpreting and constructing meaning during performance and perception (Heath, 2025; Ghodousi et al., 2022; Jimenez et al., 2022).

Research in this field notes significant interplay of emotional musical expression, semantic memory system, and emotion-inducing activity: emotional musical expression stimulates semantic-related neural networks and brain regions, suggesting that conveying emotions relies partly on semantic and schematic processing (e.g. Ghodousi et al., 2022; Turker & Reiterer, 2021), and emotion-induction enhances semantic encoding and retrieval, possibly implying that expressive music directly strengthens semantic memory (Jiang et al., 2021). It remains unclear if semantic processing drives musical emotional expression and perception or is activated by it, leaving the relationship possibly bidirectional (Storbeck, 2022; Bradley et al., 2023).

DISCUSSION

The literature review yielded two unexpected findings at the intersection of musical expression, semantic memory, and emotional induction. The synthesis of the literature revealed two themes composed of prior knowledge supported by evidence presented, new understanding gained from the transdisciplinary perspective on the topic, and research collected from the fields of musicology, neuroscience, emotions, and memory: the communicative music and its semantic origins, and the enhancement of semantic memory through self-induced emotions. These themes, when viewed from a holistic perspective, generate a promising case for emotional musical performance and its suggestive beneficial influence on memory and neural activity.

Expressive Communicational Music

For one, the literature suggests that the ability to modulate emotions through musical output has evolutionary roots, predating the development of complex language systems. There are several studies that seem to suggest this concept, with Yadav and colleagues' (2024) observations of communication in the animal kingdom laying the possible primal origin of musical communication. Their study observes that animal communication comprises various natural sounds, in which sound modules are arranged into distinct series to convey complex messages. This organization of distinct sounds to communicate resembles Carrington's (1971) description of sound communication in African talking drums, which similarly used rhythms and sound profiles to convey messages melodically. In Karlsson and colleagues' (2008) empirical study of music education, expressivity was noted to be rarely explicitly taught. Rather, the instructors focused more on the technical aspects, suggesting that general musical cues that evoke emotions are naturally interpreted and understood. When paired with research suggesting that humans all have a biological understanding of musicality (Bowling, 2023), these findings collectively imply the possibility of musical communication among organisms predating the development of more complex language. If, as Jimenez and colleagues (2022) suggest, the harmonies and musical series are stored in schemas, it creates a strong possibility for musical expression to be based on the semantic treatment and storage of musicality.

In fact, Macoir's study (2021) provided conclusive evidence that semantic background knowledge significantly influences the emotional interpretation of musical stimuli, bolstering the aforementioned possibility. Given that those with semantic impairment did not lose their sense of familiarity with melodies or musical themes (Macoir et al., 2021), the relationship between semantic memory and emotions may be distinct, making the emotional aspect of musical expression influential in its own right. Together, the literature reveals a persuasive distinction between neutral and emotional musical expression and semantic processing, with the memory system storing not only the technical aspects of music but also the emotional intent conveyed through cues or patterns.

Enhancing Semantic Processing Through Self-Imposed Emotions

The second possibility stems from the experiment conducted by Jiang and colleagues (2021), which suggested that externally induced emotions had profound effects on participants' ability to encode and retrieve semantic information. It implies that the emotional component could potentially add an unexpected context to the information, affecting how individuals encode and recall it. Jiang's findings on emotions and their influence on semantic processing begs the question: if external induction has a profound effect on our ability to encode and retrieve semantic memory, could internal emotion generation also have a similar effect? It is plausible that drawing on one's own emotions has effects similar to experiencing those emotions externally, especially when the relationship was observed from a unidirectional standpoint in Jiang's study. If so, it may mean that the relationship between semantic processing and emotions is bidirectional, where individuals who conjure emotions during semantic encoding are, in a parallel fashion, able to enhance the memorization, a foundation that would support the case that the emotional aspect of music would similarly strengthen the semantic encoding of emotions.

Since Ghodousi and colleagues' (2022) study suggests that expressed emotions alter cognitive experience entirely, it would not be surprising that adding emotional depth to musical expression could have beneficial effects on certain semantic processes beyond the realm of musicality. Another tangent that is rooted in self-induced emotions is emotional imagery, explored by Bradley and colleagues (2023). Their study established a significant connection between emotional imagery and brain activity in regions involved with motor control and semantic memory. If the mere imagination of emotions evokes neural activity and strengthens synaptic connections, it adds a dimension to the significance of emotions in musical expression, especially in semantic processing. If Jiang and Bradley's respective findings on self-imposed emotions suggest that the repeated stimulation of the brain regions showcases heightened cognitive functions, especially in the semantic processing regions, it could potentially translate to musicians performing emotionally expressive music having positive benefits in their semantic memory system, where even the mere internal intent of imbuing emotions has an impact. If so, this would be a unique inversion of the common trope in the literature of musical stimulus. It could mean that performances do not have to be emotionally compelling to others to still have a profound effect on the performer if their intent is candid. Perhaps this entails a more general association, in which emotion induction and imagination yield benefits to other skills, beyond musical expression.

Viewing these themes collectively reveals that the emotional aspect of music may not be as accessory as previously perceived literature, instead suggesting that it may have cognitive benefits, primarily semantic processing, a perceived gap in the available and accessible literature. The extent to which emotional expression in music affects semantic processing may be less persuasive, given the plethora of factors that may influence the proposed association. Perhaps more substantial evidence for such a relationship could clarify what learning music entails, and when emotional intent becomes a central topic in music lessons, unlike what Jiang and colleagues (2021) observed in their study. The next section will outline how such a perspective may have on future research, as well as review the limitations and shortcomings of the research process pertaining to the overarching research question.

CONCLUSION

Based on the synthesized literature, there is potential for emotionally expressive music to positively influence semantic memory. It seems that emotions have an unprecedented impact on semantic processing, and musical expression is an effective medium for facilitating such interplay. Although research was conducted on the premise that there are some correlations between expressed emotions and semantic processing, the extent to which even externally induced emotions could influence semantic encoding and retrieval (Jiang et al., 2021) was surprising. How the mere act of thinking about conveying various emotions could change the cognitive experience (Ghodousi et al., 2022) was not anticipated in the literature review. The evidence used to support the conclusion regarding the performance of emotionally expressive music, however, may not be conclusive, as the association is purely inferential. The conclusion was derived by converging three bodies of literature: (a) the neurally distinct nature of emotion and neutral musical performance, (b) the enhancement of semantic encoding with induced emotions, and (c) the storage of musicality as semantic knowledge. No literature isolates emotional musical performance from semantic memory for comparison, so the proposed answer depends on the validity of both components. Should future empirical research confirm a direct association between performing emotionally expressive music and semantic memory enhancement in the performer, it could have implications for musical education, therapy, and even language acquisition, where emotional engagement in music-making is leveraged as a cognitive tool.

Limitations and Recommendations for Future Studies

This transdisciplinary literature review has several limitations and shortcomings that warrant consideration. The first and most obvious limitation in the analysis is the lack of professional expertise in neurobiological procedures. The paper is deficient in its explanation and analysis of neuroimaging results and in its coverage of complex systems across multiple brain regions, drawing on multiple sources (e.g., Bradley et al., 2023). Neuroscientific systems may have been overlooked or missed due to limited understanding. A deeper understanding of neuroscientific knowledge regarding auditory stimuli, memory systems, and biological implications would help clarify the scope of the literature cited in this paper.

Another limitation is that the relationship between semantic encoding and self-induced emotions has neither been tested nor supported in the literature. It was inferred solely from the statistically significant impact of external emotion induction on semantic processing, based on Jiang and colleagues' (2021) findings. Evidence for the proposed bidirectionality of emotion induction relies on the assumption that self-generated emotions have effects like those of externally induced emotions. The cognitive processes underlying self-induced emotions may differ from those underlying passive emotional reception, potentially weakening or even reversing the suggested effect.

Furthermore, the studies regarding music training and expressive musicality cited in this literature review (e.g. Cheng et al., 2022; Dittinger et al., 2021; Heath, 2025) attribute cognitive and memory benefits to music training broadly, not specifically to emotionally expressive music. When emotional expressivity is not considered in these studies, it is difficult to isolate it because other cognitive processes co-occur. In addition, if musical performance does influence semantic processing, it raises the question of timing: how close in time do musical performance and semantic encoding or retrieval occur? If performance and semantic processing had to occur simultaneously to produce a tangible impact, would the association serve much value? The temporal, perhaps even spatial, relationships between musical expression and semantic processing would need to be considered to gauge the adaptability of such findings. Future research would need to explicitly hold other variables, such as technical level and training duration, constant while varying emotional expression and time between performing emotionally expressive music with semantic processing across multiple trials and participants. Moreover, there is a lack of consensus on what constitutes semantic memory across studies. While Jiang and colleagues (2021) use geographical name recall, Jimenez and colleagues (2022) use harmony recognition to measure semantic function. Cross-study comparison is debatable when there are no standards for what comprises semantic memory in these music-adjacent studies. The literature review also includes relatively small sample sizes and demographics, with Ghodousi and colleagues (2022) reporting only 10 participants, a skewed gender ratio (8 male to 2 female), and Jiang et al. (2021) reporting a 57-participant sample that was predominantly female. These samples limit the generalizability across gender, instrument type, and age since the research question concerns musicians broadly. Finally, there is subjectivity when defining what constitutes "emotionally expressive" musical performances. As Karlsson and colleagues (2008) suggest in their study, emotional expression is rarely explicitly defined or taught but is instead communicated through vague metaphorical comparisons that are open to interpretation. When emotional musical expression varies across teachers, students, cultures, and musical traditions, operationalizing "emotionally expressive musical performance" as an independent variable becomes exceedingly difficult.

To address these limitations, we could employ a specialized definition of semantic processing and maintain a standardized framework for semantic knowledge. An experiment that could test the validity of emotionally expressive music enhancing semantic memory could have musicians perform pieces twice, once with emotional neutrality and once with emotional dynamics, immediately followed by semantic memory tasks to gauge encoding and retrieval performance across the conditions. It could establish a more direct relationship between semantic processing and emotional musical performance.

General Summary

This paper explores music's capacity to transmit and preserve emotional experience and its significance to semantic memory. The goal of this literature review was to identify the intersection of emotions and semantics in the medium of musical performance, shifting the focus from consumer to creator and examining how performers may be influenced in acts of emotional vulnerability. The literature reviewed suggests that performing emotionally expressive music recruits meaningful neural networks in semantic processing, pointing towards a cognitive benefit that may extend beyond musicianship. Such implications could shift the pedagogy of music education, leverage it for therapeutic interventions, or even become a prominent cognitive tool for students across the globe. In addition, the literature suggests that the performer is not merely a passive recipient of music's effects but an active agent in the transmission of emotion, with a clear distinction between performing music and hearing it. Understanding what that agency does to the performer's own mind may be one of the more generative questions in the cognitive neuroscience of music. There is no doubt that this path requires further research as scientists continue to explore music through a transdisciplinary lens.

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