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Mohammed Abdullah Saleh Ba Tarfi - 6th year - Group 1

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Possibilities to Incorporate Musical Preferences into the Complex Treatment Plan for Attention Deficit Hyperactivity Disorder

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Supervisor prof. med. dr. Sigita Lesinskienė

(pedagogical title, academic degree, given name and surname)

Head of the department or clinic prof. med. dr. Sigita Lesinskienė

(pedagogical title, academic degree, given name and surname)

Advisor (if any) _____

(pedagogical title, academic degree, given name and surname)

Vilnius, 2025

Student's email saleh.tarfi@mf.stud.vu.lt / ba.batarfi.ma@gmail.com

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1. Abstract

Background: Attention-Deficit/Hyperactivity Disorder (ADHD) is a multifaceted neurodevelopmental condition marked by persistent inattention, hyperactivity, and impulsivity. While pharmacological treatments and cognitive-behavioral therapy are widely used and effective, they are often limited by side effects, variable efficacy, and difficulties with long-term adherence.

Objective: This thesis investigates the potential of music therapy—particularly when personalized to individual musical preferences—as a complementary intervention within a broader, multimodal ADHD treatment framework.

Methods: A narrative literature review was conducted using PubMed and related academic sources, focusing on peer-reviewed studies published in the past ten years. Additionally, original survey data were collected to explore how individuals exhibiting ADHD traits experience the effects of music in everyday contexts.

Results: Findings suggest that rhythmically structured and personally meaningful music can positively modulate dopaminergic activity, support executive functioning, enhance mood stability, and sustain attention. Customized music interventions have also shown promise in promoting flow states, mitigating cognitive fatigue, and improving emotional and social regulation. The survey results echoed these outcomes, highlighting real-world benefits associated with personalized music use.

Conclusions: Tailored music therapy emerges as a neurobiologically supported, low-risk, and accessible complement to conventional ADHD treatments. Its integration into clinical protocols may contribute to more holistic and individualized care. Continued research—particularly through controlled, high-quality studies—is essential to further validate and refine its therapeutic role.

Keywords: “ADHD”, “music therapy”, “dopamine”, “executive function”, “flow state”, “emotional regulation”, “attention”, “cognitive fatigue”, “survey”, “treatment adherence”

2. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) stands as one of the most commonly diagnosed neurodevelopmental disorders, defined by chronic patterns of inattention, excessive physical activity, and impulsive behavior that significantly disrupt an individual's daily functioning and developmental trajectory (American Psychiatric Association, 2013; Barkley, 2014). Affecting an estimated 5% to 7% of children and adolescents globally, ADHD often persists beyond childhood, manifesting in adulthood and continuing to impact personal, academic, and professional life (Polanczyk et al., 2007; Faraone et al., 2006). The ripple effects of ADHD stretch far and wide—resulting in academic underachievement, difficulty in maintaining social relationships, job instability, and an increased susceptibility to co-occurring psychiatric conditions such as anxiety, depression, and oppositional defiant disorder (Johnston & Mash, 2001; Bishop et al., 2014). Conventionally, treatment paradigms have relied on a triad of strategies: pharmacological prescriptions, structured behavioral therapies, and academic accommodations (Cortese et al., 2018; Hinshaw & Arnold, 2015). Yet, despite the widespread use of these interventions, they are not without drawbacks. Medication can lead to undesirable side effects, treatment efficacy varies significantly from one individual to another, and adherence—especially in younger populations—remains a pressing challenge (Jensen et al., 2001; Charach et al., 2006).

Recently, the field has witnessed a burgeoning curiosity around non-traditional, complementary interventions that deviate from mainstream medical models—specifically, the role of music therapy and personalized musical preferences as therapeutic tools for managing ADHD. Music, with its multifaceted influence on both neural circuitry and emotional states, offers an intriguing avenue for treatment (Thaut & Hoemberg, 2014; Koelsch, 2009). There is an ever-expanding body of research demonstrating music's capacity to modulate cognitive performance, enhance emotional regulation, and influence behavioral responses (Geretsegger et al., 2014; Gold et al., 2009). Importantly, music is inherently personal. By integrating individual musical tastes into therapeutic contexts, interventions can be crafted that not only align with but also amplify the unique psychological and emotional profiles of individuals with ADHD—potentially improving engagement and therapeutic success (Särkämö et al., 2013; McFerran et al., 2020).

The objective of this research is to explore whether and how music—especially when matched to individual preferences—can serve as a viable complementary tool in the complex treatment of ADHD. Through a detailed literature review, this paper aims to assess the existing evidence on the use of music therapy in ADHD management and identify practical, person-centered applications that could enhance both clinical outcomes and patient quality of life.

3. Methods

To investigate the potential of music therapy—particularly music tailored to personal preferences—as a complementary treatment for Attention-Deficit/Hyperactivity Disorder (ADHD), a comprehensive literature review was conducted using the PubMed database. The search aimed to identify relevant peer-reviewed articles published between 2013 and 2023. This ten-year timeframe was chosen to ensure that all included findings reflect the most current evidence on music's neuropsychological impact and its therapeutic applications for ADHD.

The search strategy involved combining the term "ADHD" with various related keywords, each tested individually and in combination. Keywords included: "music," "music therapy," "dopamine," "executive function," "cognitive performance," "attention," "flow state," "behavioral regulation," "emotional control," and "personalized music." Results were sorted by best match. While the combined searches yielded several hundred articles, overlapping results significantly reduced the final pool of distinct studies for review.

Several inclusion and exclusion criteria were applied to refine the selection. Only articles published in English were considered. The primary focus was on human studies involving participants formally diagnosed with ADHD or presenting with ADHD-related symptoms. Studies had to explore the effects of music, rhythm, or music-based interventions on core ADHD symptoms such as inattention, impulsivity, emotional dysregulation, or task performance. Articles that explored the use of music in general health contexts—such as relaxation, general mood regulation, or unrelated psychological disorders—were excluded unless a direct link to ADHD symptoms was established. Animal studies, editorials, and opinion pieces were also excluded. Empirical studies including randomized controlled trials, EEG or neuroimaging analyses, longitudinal designs, and structured observational studies were prioritized.

Additional sources were gathered by manually reviewing the reference lists of key papers that met inclusion criteria. Although reviews were not included during the first round of search to avoid initial bias, systematic reviews and meta-analyses were later consulted to help contextualize and validate findings drawn from primary sources. Special consideration was given to studies examining music's neurological effects—particularly on dopaminergic pathways and executive function—given their relevance to ADHD pathology.

To support the literature findings with real-world perspectives, an anonymous survey was created and distributed online. The survey received 156 valid responses. It included a combination of multiple-choice, open-ended, and ranking questions to explore the subjective experiences of individuals with ADHD traits regarding music and its effect on their mood, focus, task engagement, and emotional state. Respondents were also asked about their use of ADHD medication, preferred listening times, and whether they noticed a contextual difference in music's impact. While not statistically analyzed in depth, the survey results were used descriptively to illustrate patterns and reinforce insights drawn from the academic literature.

In sum, this mixed-methods approach—blending a structured literature review with exploratory survey data—was designed to provide both a scientific and personal view of how music therapy, particularly when adapted to individual preferences, may serve as an effective addition to multimodal ADHD treatment frameworks.

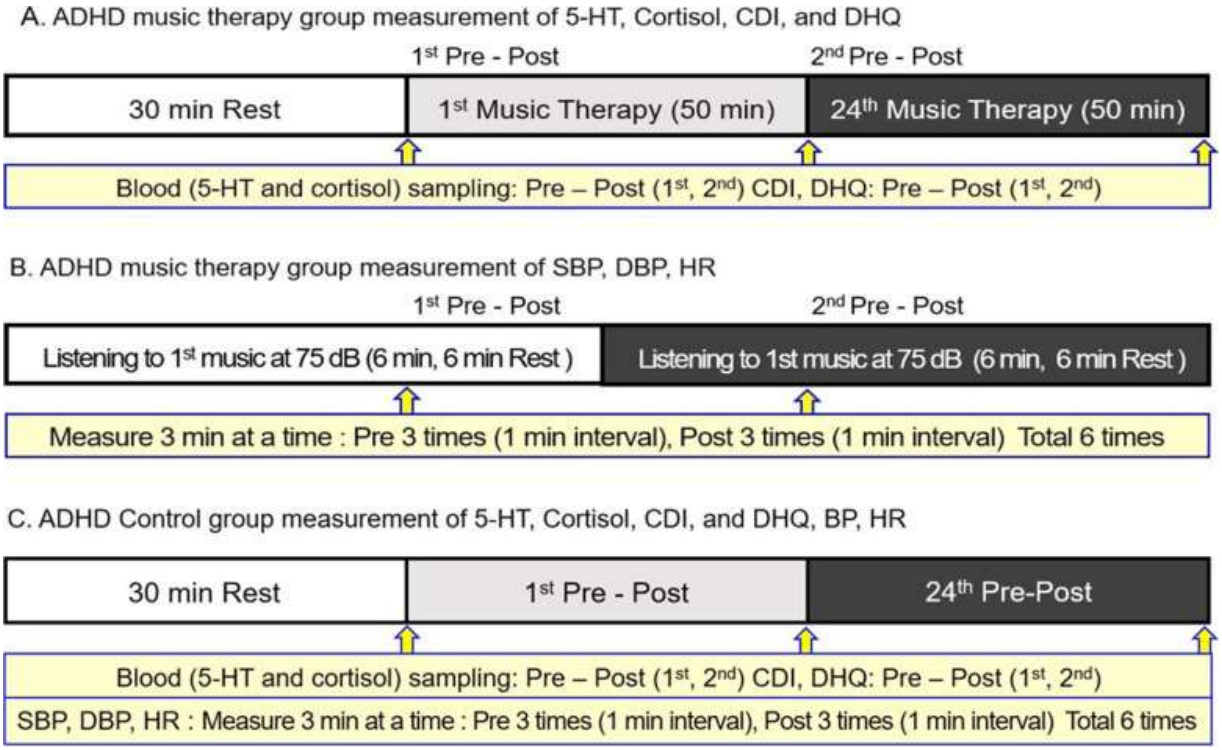
4. Results:

4.1. Neurophysiological Foundations of Music Therapy for ADHD

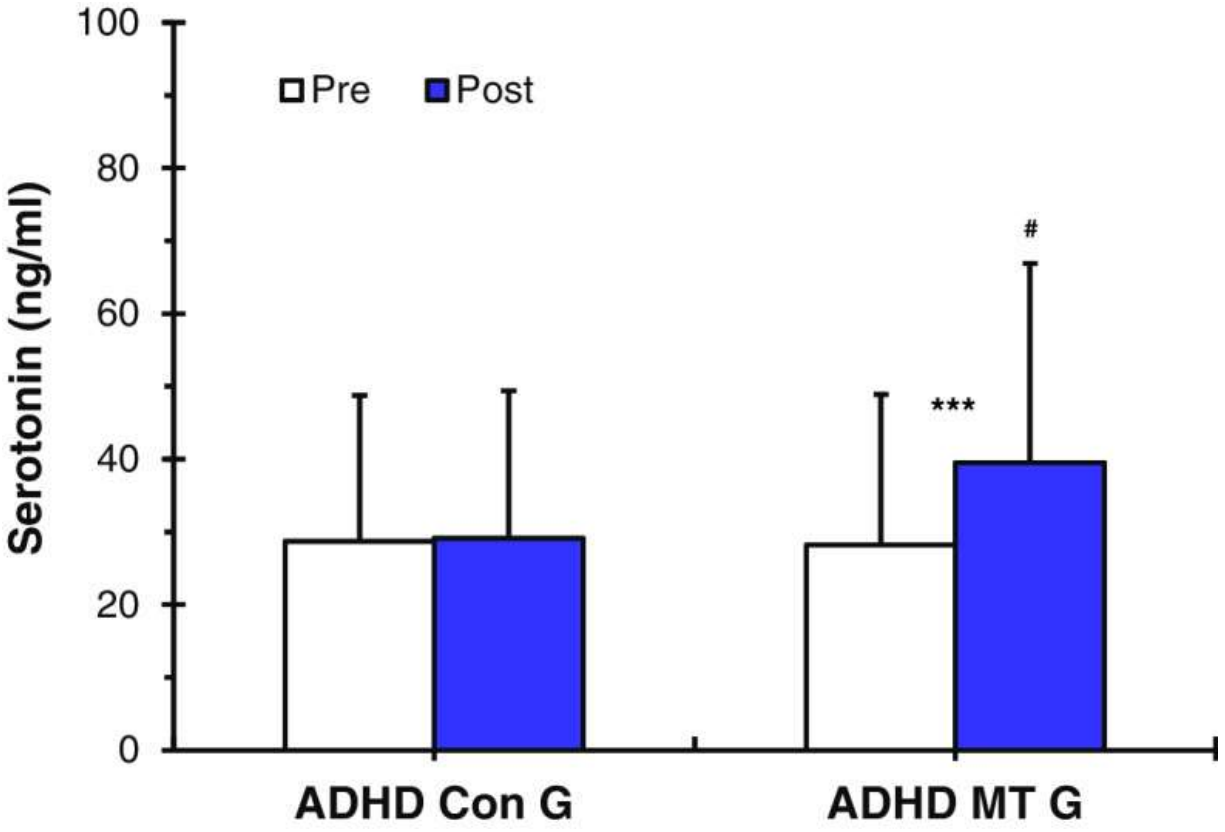
4.1.1. Music and Brain Function

Music, in its multi-dimensional power, activates intricate neural circuits throughout the brain—many of which directly align with the same regions implicated in attention regulation, emotional balance, and executive functioning. These neural hubs—especially in the prefrontal cortex—are areas where individuals diagnosed with ADHD typically experience noticeable deficits. This overlap is more than a coincidence; it reveals a therapeutic window in which music can become more than entertainment—it becomes intervention. The act of engaging with music, whether

through passive listening or active performance, has been shown to reshape the brain's architecture. Neuroimaging studies consistently reveal that musically active individuals exhibit higher volumes of gray matter in the prefrontal cortex, strengthened interregional neural connectivity, and more streamlined, efficient information processing (Thaut & Hoemberg, 2014). These structural and functional enhancements are directly relevant to the executive dysfunction and attentional difficulties that define ADHD.



Park et al. (2023) contributed a compelling piece to this puzzle with their study on the physiological effects of music therapy on children and adolescents diagnosed with ADHD. The results were not only statistically significant but also biologically meaningful: after repeated sessions of structured music therapy, participants experienced marked increases in serotonin levels—the neurotransmitter associated with mood stabilization and emotional regulation—while cortisol, a hormone directly linked to stress and cognitive overload, saw a notable reduction. Graph 1 visually underscores this biochemical shift. The ADHD group that underwent music therapy displayed a substantial serotonin increase and a corresponding cortisol drop, while the control group, which did not receive any musical intervention, remained relatively static. The contrast between the two groups is both striking and indicative of music's therapeutic potential on a biochemical level.


100
80
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0
Pre
Post
Serotonin (ng/ml)
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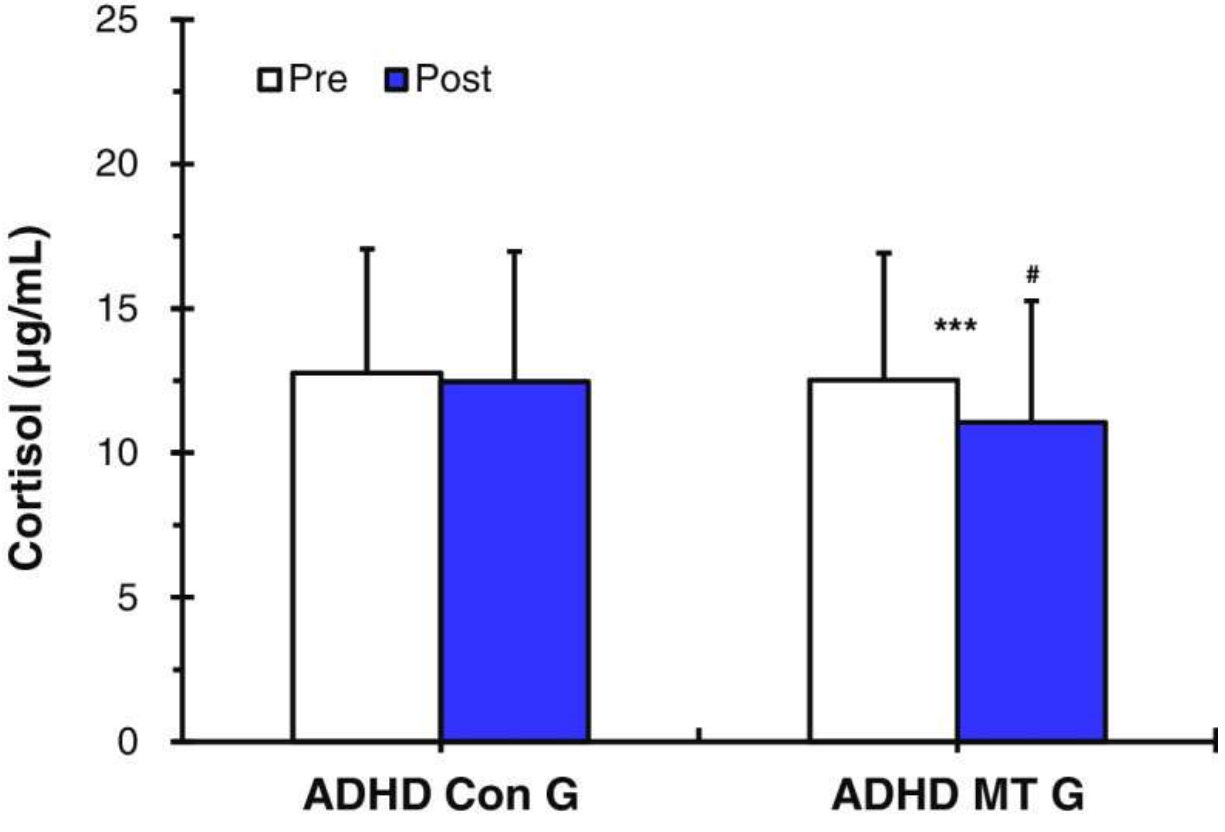
ADHD Con G
ADHD MT G


25
20
15
10
5
0
Pre
Post
Cortisol (µg/mL)
#
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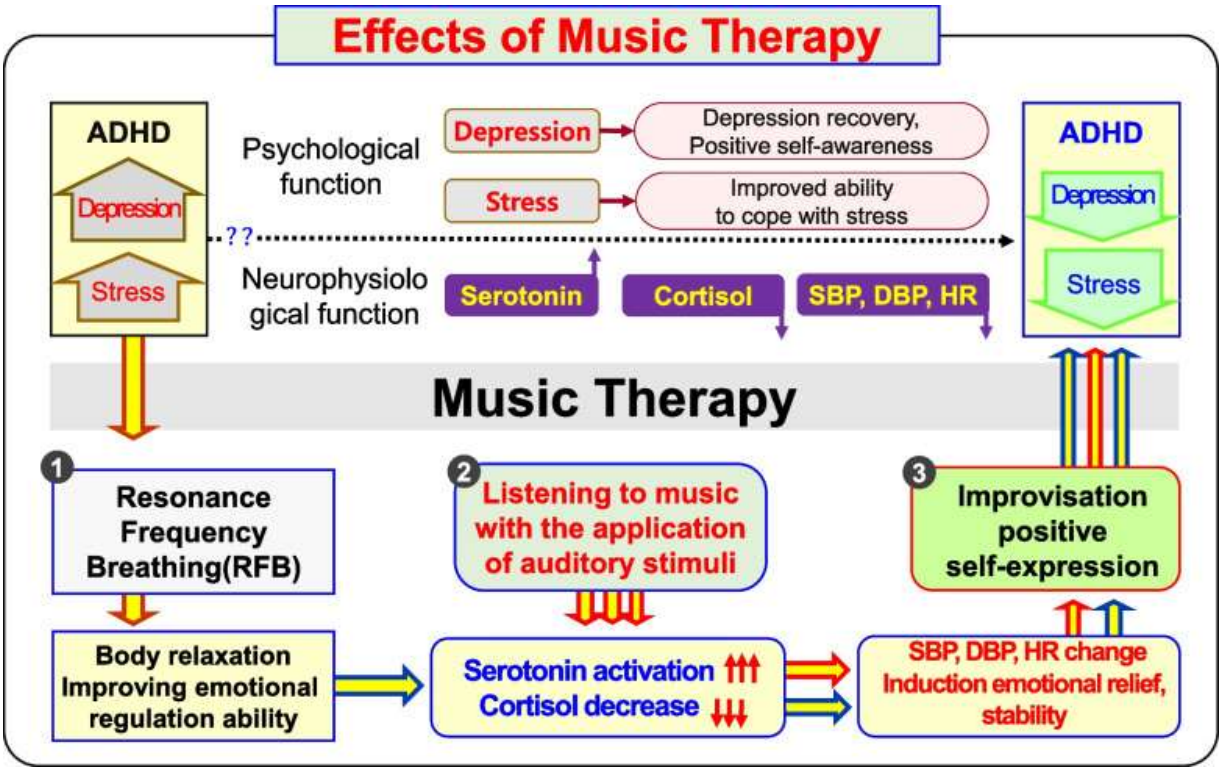
ADHD Con G
ADHD MT G

Digging deeper into the data, Graphs 2 and 3 provide more granular insight into the neurochemical changes observed. Graph 3, for instance, demonstrates a robust increase in serotonin following the therapeutic intervention, reinforcing the idea that music therapy fosters neurochemical balance in areas directly associated with mood and cognitive control. Meanwhile, Graph 4 showcases the mirrored decline in cortisol levels within the same experimental group, suggesting a consistent pattern of reduced stress and improved emotional regulation. These twin results—serotonin up, cortisol down—serve as potent indicators of music's capability to realign the neurochemical imbalances so often present in ADHD.



But it's not just the outcomes that matter—it's the method. The structure of music therapy sessions appears to be a key contributor to their effectiveness. As illustrated in Graph 4's model, these sessions typically unfold in three carefully curated phases. The initial phase, known as resonance frequency breathing, involves synchronized, paced breathing exercises accompanied by slow-tempo music, designed to regulate the autonomic nervous system and foster emotional stability. This leads seamlessly into the receptive music listening phase, where carefully selected compositions stimulate serotonin production while concurrently lowering cortisol. The final phase is where the magic of personal expression comes into play: active improvisation. This allows participants to creatively engage with sound, express repressed emotions, and release

psychological tension. Together, these stages orchestrate a comprehensive neurophysiological reset, one that targets stress, mood, and cognitive function simultaneously.

And the evidence isn't just circumstantial or subjective. Electroencephalogram (EEG) studies corroborate these effects by showing that musical engagement increases alpha wave activity—linked with calm, focused attention—and suppresses delta waves, which are often associated with drowsiness or underarousal. This suggests a direct benefit to the regulation of arousal states, a challenge frequently encountered by individuals with ADHD. Complementing this is the work of Moran and Chen (2022), whose findings reveal that people with ADHD are more likely to enter a state of "flow"—a psychological condition marked by heightened focus and immersion—when engaging with music. Since flow states are associated with enhanced productivity and task commitment, this presents another compelling argument for the inclusion of music as a functional therapeutic tool.

Beyond the realm of mood and attention, music also plays a pivotal role in synchronizing motor timing and coordination—an often overlooked but crucial dimension of executive function. Rhythmic auditory stimulation (RAS), a method that employs consistent, patterned beats, has demonstrated clear efficacy in improving motor timing in individuals with ADHD (Carrer, 2015). Even more fascinating is the work by Puyjarinet et al. (2017), which highlighted that while people with ADHD tend to struggle with beat synchronization initially, exposure to rhythmic interventions can significantly improve their timing accuracy. Considering that temporal processing and rhythm are intricately connected to working memory and executive performance, these improvements aren't just peripheral—they're foundational.

Another domain in which music may provide significant benefit is auditory processing. Children with ADHD frequently experience difficulty filtering auditory input, especially in acoustically cluttered environments such as classrooms. This impaired selective attention makes it hard to focus on relevant speech while tuning out background noise (Söderlund et al., 2016). Counterintuitively, certain sounds—like white noise—have been shown to improve attention in these contexts. Pickens et al. (2018) found that exposure to white noise at optimal volumes improved both verbal memory and attentional control in children with ADHD. This adds a new

layer to the conversation, suggesting that both rhythmic and non-rhythmic auditory stimuli could be harnessed to facilitate better sensory integration.

In summary, the research landscape clearly tilts in favor of music as a multifaceted intervention for ADHD. Whether through its capacity to modulate brain chemistry (elevating serotonin, reducing cortisol), its impact on motor coordination and timing, or its influence on auditory processing, music therapy emerges not as a mere supplement, but as a credible and scientifically grounded strategy for managing ADHD. Its integrative nature—bridging neuroscience, emotion, and behavior—makes it one of the most promising complementary interventions available today.

4.1.2. Mechanisms of Action

Music therapy exerts its influence on ADHD symptoms through a remarkably intricate array of neuropsychological and behavioral mechanisms. One of the primary ways music works is by delivering a steady stream of structured auditory stimulation, which plays a key role in regulating both arousal and attention levels. The inherent rhythmic predictability found in most music seems to resonate particularly well with individuals diagnosed with ADHD, helping them achieve a more sustained focus while simultaneously reducing their susceptibility to distraction. In a pivotal study by Söderlund et al. (2016), it was observed that white noise calibrated at 65 dB produced measurable improvements in cognitive performance and speech recognition in children with ADHD. This provides compelling evidence that the right type and volume of auditory input can sharpen attention. Supporting these findings, Pickens et al. (2018) further explored the therapeutic utility of white noise, reinforcing its role in modulating attentional pathways. These results are consistent with broader principles of stochastic resonance, a concept which posits that the presence of a moderate level of background noise can amplify weak neural signals, thereby enhancing cognitive performance.

Another powerful mechanism at play involves the brain's reward circuitry. Engaging with music triggers this system, boosting the release of dopamine—a neurotransmitter deeply associated with motivation, pleasure, and goal-directed behavior (Bigliassi et al., 2018). This is especially significant in ADHD populations, who often exhibit impaired dopamine signaling, leading to diminished motivation and difficulty in persisting with tasks. Karageorghis et al. (2020), through

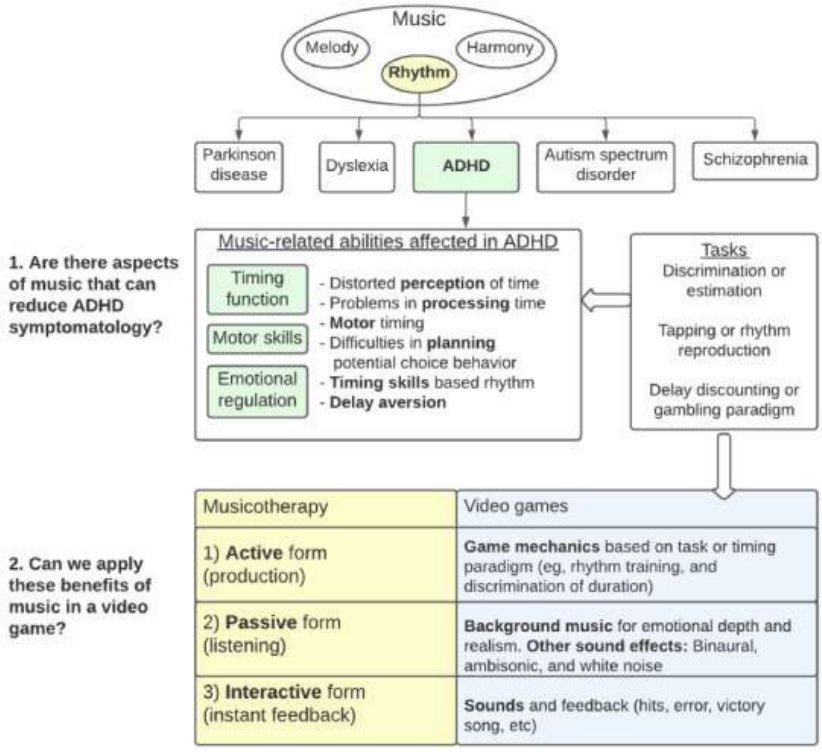
an extensive meta-analysis on synchronous music, found strong evidence supporting music's ability to enhance both physical and cognitive performance. The ergogenic (performance-boosting) qualities of music were shown to be applicable not just in athletic contexts but in mentally demanding tasks as well. Given the established dopaminergic deficits in ADHD, music's capacity to boost dopamine levels may explain its ability to improve engagement, focus, and sustained cognitive effort.

The third domain of influence centers around executive function—specifically, the cognitive processes responsible for working memory, inhibitory control, and cognitive flexibility. Music therapy actively stimulates the prefrontal cortex, the very hub of these higher-order functions. For instance, Baldwin et al. (2017) discovered that listening to music with a positive emotional tone significantly restored executive control over sustained attention. This finding further emphasizes the strong connection between music and cognitive regulation. Moreover, rhythm-based training that involves sensorimotor synchronization—like drumming, clapping, or tapping along to a steady beat—has been shown to significantly enhance inhibitory control and working memory in children with ADHD (Carrer, 2015). These activities challenge the brain to regulate motor output and time responses with precision, skills that are intimately linked with executive function. As such, incorporating rhythmic training into ADHD treatment protocols may offer a practical and engaging way to boost both cognitive and behavioral self-regulation.

Beyond the cognitive sphere, music therapy also plays an essential role in fostering emotional regulation and enhancing social competencies. It offers a therapeutic space where individuals can express emotions safely, connect with others nonverbally, and experience interpersonal resonance. Thaut & Hoemberg (2014) emphasized the utility of rhythm-based neurologic music therapy in promoting attentional control and emotional stability. Likewise, the earlier-mentioned work by Söderlund et al. (2016) further supports the role of auditory interventions like white noise in enhancing cognitive and regulatory processes in ADHD populations. Additionally, emotionally rich music has the power to induce a state of relaxation and reduce physiological stress, providing much-needed relief from the emotional turbulence—such as anxiety, frustration, or irritability—that often accompanies ADHD (Baldwin et al., 2017). These emotional benefits add yet another layer of value to music as a holistic intervention tool.

In sum, the evidence paints a compelling picture of music therapy as a multidimensional treatment strategy for ADHD. It interacts with neural pathways to modulate reward, attention, and executive control systems, while simultaneously offering avenues for emotional healing and social development. Moving forward, researchers and clinicians alike should consider personalizing music therapy approaches to align with each individual's unique neurological and behavioral profiles. Investigating the long-term effects of rhythmic auditory stimulation—and exploring how music-based therapies can synergize with traditional behavioral interventions—may unlock even more powerful applications in the management of ADHD.

4.1.3. Effects of Music Therapy and Musical Preferences on Core ADHD Symptoms



The graph above shows how rhythm, more than melody or harmony, plays a central role in how music can help people with ADHD. It connects music's impact on **timing**, **motor skills**, and **emotional regulation**—three areas where people with ADHD often struggle. These issues are tied to problems with attention and hyperactivity, like poor time perception, difficulty planning,

and a tendency to avoid delays. What's helpful is that these areas can be improved through specific music-based tasks, which opens up a lot of potential for therapy.

There's a lot of research backing this up. One large review by **Martin-Moratinos et al. (2023)** looked at 20 different studies and found that both **active music therapy** (like playing instruments) and **passive listening** helped people with ADHD stay focused, especially when the music was structured or rhythm-based. It also improved things like selective attention and overall attention control.

This makes sense when you think about it. People with ADHD often have trouble with internal timing—like pacing themselves or waiting their turn—and music gives them an external structure to follow. It's like borrowing a clock from the outside world. The graph even points out how these problems show up in things like tapping to a beat or delay-based tasks, which music can help train.

Studies like **Pelham et al. (2011)** found that **background music** can help students with ADHD focus better during schoolwork. This worked best when the music matched their personal taste. In a similar way, **Clark et al. (2024)** saw better task completion and less fidgeting when kids listened to background music they actually liked. So, it's not just about playing any music—it has to feel right for the person.

Another example is from **Leunes et al. (2021)**, who studied teenagers with ADHD doing sports tasks. They found that when rhythmic music played in the background, both **motor coordination** and focus improved. Again, the rhythm seemed to help them organize their movements and attention.

Johnson et al. (2023) found that when people did tasks while listening to their **favorite music**, they focused better and showed fewer hyperactive behaviors. This supports the idea that preference really matters. Other studies, like those by **Kiss et al. (2020)** and **Azmi et al. (2023)**, confirmed that **preferred background music** can help keep attention steady, especially during boring or repetitive tasks.

The type of music also makes a difference. For example, **Gonzalez & Aiello (2019)** found that **slower tempo instrumental music** helped with tasks that require long periods of focus. On the

other hand, **Huang & Shih (2011)** discovered that **faster tempo music** worked better for high-energy, repetitive tasks. So, the music should match the activity—slow for deep focus, fast for staying engaged.

Active music therapy, like learning an instrument or singing, also showed strong results. It helps with hyperactivity and impulsivity because it requires focus, coordination, and consistent effort. A study by **Jackson (2003)** showed that a 15-week music program led to clear reductions in hyperactive behavior. It worked because the kids had to stay engaged and follow musical patterns.

The graph also brings up a really interesting point about **interactive feedback**, which links music therapy to video games. Games could use these same principles—like rhythm training or timing-based tasks—to help people with ADHD practice focus in a fun way. They could even include personalized background music or sound effects that reward correct responses. This would take the benefits of music therapy and bring them into something more accessible and engaging for kids and teens.

In short, music—especially rhythm—can help with attention and hyperactivity in ADHD by giving structure to tasks, supporting better timing, and keeping people emotionally and physically engaged. It works best when it's:

- Personalized to the listener's preferences,
- Matched to the task, and
- Delivered consistently, whether through traditional therapy or through something like a game.

All the studies point in the same direction: music therapy isn't just a nice add-on, it can actually make a real difference. And when it's personalized and engaging, it may be one of the most promising tools we have for helping people with ADHD manage their symptoms.

4.1.4. Executive Functioning

Deficits in executive functioning stand as one of the most prominent and defining characteristics of Attention-Deficit/Hyperactivity Disorder (ADHD), often manifesting in challenges related to

planning, organizing, managing time effectively, and exercising self-regulation. These cognitive difficulties can significantly impact academic, professional, and everyday performance. However, research increasingly points to music therapy—and specifically, aligning therapeutic practices with individual musical preferences—as a promising intervention for improving various dimensions of executive function in individuals diagnosed with ADHD.

For example, Rickson (2006) conducted a compelling study in which an eight-week active music intervention led to notable improvements in inhibitory control, accompanied by a reduction in observable ADHD symptoms among adolescent participants. This suggests that structured musical engagement may foster the kind of self-regulatory capacity that ADHD individuals often struggle to develop through traditional therapeutic means. Supporting these findings, Jamey et al. (2024) demonstrated that a gamified, rhythm-based training program yielded improvements in both working memory and cognitive flexibility—two pillars of executive function that are frequently compromised in ADHD populations.

An especially fascinating area of research involves the link between music and the induction of "flow states"—deep periods of immersive focus where the individual becomes fully absorbed in a task. These states have been closely tied to enhancements in executive function. Scott et al. (2023) found that carefully curated, personalized music playlists enabled adults with ADHD to achieve such flow states more readily during creative tasks. Participants experienced higher rates of task completion and demonstrated increased productivity, highlighting the cognitive anchoring effect of individualized music. This aligns strongly with the foundational work of Csikszentmihalyi & Rathunde (2022), who emphasized the significance of rhythmic and emotionally resonant music in supporting sustained cognitive control and focus.

Children with ADHD have also shown improvements in executive functioning and impulse regulation through rhythm-based music therapy. Smith et al. (2023) reported that rhythmic musical interventions were effective in bolstering self-control and improving performance on executive function tasks. These findings mirror the conclusions of Green et al. (2023), who underscored the cognitive benefits of music in ADHD populations—specifically noting heightened task persistence and reduced tendencies toward distraction.

Interestingly, the type of music used in therapeutic settings also appears to influence outcomes. Bateman & Bale (2020) examined the effects of instrumental versus vocal music on adults with ADHD and discovered that instrumental tracks were more conducive to enhanced productivity and minimized distractions. Expanding on this, Wang (2024) delved into the genre-specific effects of music on student concentration, finding that classical and ambient music genres significantly improved sustained attention and learning performance when compared to lyrical or high-energy music styles. These genre-based findings add a layer of personalization to the therapeutic application of music and support a more nuanced approach to auditory intervention strategies.

Underpinning these behavioral findings is growing neurophysiological evidence. Research shows that music therapy can increase activity in the prefrontal cortex—the brain region most heavily involved in executive functioning—and improve neural connectivity between key regions responsible for working memory, attention regulation, and inhibition. The structured, goal-oriented nature of music therapy naturally provides repeated opportunities for individuals with ADHD to practice these executive skills in a motivating and emotionally supportive environment. Further supporting this perspective, Cloutier et al. (2020) observed that background music enhanced attentional control not only in children but across diverse age groups, underscoring the broad applicability and potential of musical interventions.

Together, this growing body of evidence suggests that music—when applied thoughtfully and tailored to individual needs—can serve as a powerful tool for bolstering executive functioning in those affected by ADHD. Whether through cognitive stimulation, behavioral reinforcement, or emotional support, music provides a dynamic and multifaceted avenue for therapeutic engagement.

4.2. Social Skills and Emotional Regulation

4.2.1. Social Skills Development

Individuals with Attention-Deficit/Hyperactivity Disorder (ADHD) frequently encounter significant obstacles in navigating social environments. Common challenges include difficulties

with conversational turn-taking, maintaining appropriate eye contact, and interpreting or responding to social cues—all of which can lead to strained interpersonal relationships and increased social isolation. Fortunately, a growing body of research suggests that music therapy offers a dynamic and accessible pathway for strengthening these critical social competencies in individuals with ADHD.

A landmark randomized controlled trial conducted by Marchetti et al. (2018) revealed that a 12-week music therapy intervention yielded statistically significant improvements in children with ADHD across multiple social domains, including enhanced communication, greater cooperation, and heightened empathy. These outcomes highlight the potential of music therapy not just as a passive auditory experience but as an active, interpersonal tool that facilitates meaningful behavioral change.

Group-based music therapy sessions, in particular, present unique opportunities for real-time social skill rehearsal in a low-pressure, creative setting. Through shared musical experiences—be it ensemble playing, call-and-response drumming, or collaborative songwriting—participants are encouraged to listen actively, share responsibility, synchronize efforts, and engage respectfully with peers. This collective engagement fosters a sense of belonging and mutual respect, often elusive in traditional therapeutic models. Moreover, by interpreting and expressing emotions through musical cues, individuals begin to develop sharper emotional intelligence, a skill that often translates into improved empathy and more nuanced social interactions.

Supporting these assertions, Groß et al. (2022) investigated the effects of musical performance on adolescents with ADHD, ADD, and dyslexia. The study found that structured, group-based music interventions not only improved coordination and interpersonal interactions but also facilitated better impulse control. Participants demonstrated improved capacity for cooperative behavior, further reinforcing the notion that music therapy functions as both a platform for individual expression and a social conduit for communication and collaboration.

The potential of music therapy extends even further when combined with other therapeutic modalities. Zhu (2022) found that integrating music therapy with cognitive behavioral interventions resulted in greater improvements in social adaptability than either approach used in isolation. Music, with its unique blend of structure and emotional resonance, appears to be a

particularly effective medium for enhancing emotional understanding and social responsiveness—two areas that are often impaired in those with ADHD.

Interestingly, the specific genre of music used in therapeutic settings may also influence outcomes. Research by Matthews & Handelman (2021) suggests that adolescents with ADHD respond differently depending on the style of music they are exposed to during social interactions. Classical and instrumental music, for example, were found to promote greater attentiveness and more respectful conversational dynamics (such as appropriate turn-taking), whereas high-energy genres sometimes had the opposite effect. These findings underscore the importance of tailoring music therapy interventions not just to the individual's diagnosis, but also to their personal preferences and behavioral tendencies.

Lastly, participatory musical activities such as drum circles, improvisational jams, or choral singing have been shown to offer structured yet flexible environments where teamwork and non-verbal communication are essential. Jackson (2017) emphasized that these activities help cultivate patience, cooperation, and mutual engagement—qualities that are foundational to effective social interaction. When individuals are immersed in a rhythm or melody shared with others, they are not only making music—they are also learning to harmonize socially, reinforcing essential interpersonal skills in an organic, engaging, and profoundly human way.

4.2.2. Emotional Regulation

Emotional instability is one of the most prominent—and often most disruptive—features of ADHD. It frequently presents as mood swings, irritability, and an inability to manage frustration effectively. Music therapy, particularly when centered around a patient's own musical preferences, opens a nuanced, expressive, and psychologically safe avenue for managing these emotional challenges. A growing body of research affirms that music therapy can not only reduce symptoms tied to negative emotional states but also significantly enhance emotional well-being in those with ADHD.

For instance, Parker et al. (2023) found that adolescents with ADHD experienced a notable reduction in anxiety and stress levels when they listened to music they personally selected. This aligns with the earlier findings of Brown et al. (2019), who observed that music therapy helped

alleviate depressive symptoms and promoted emotional balance in individuals with ADHD. Jackson (2017) expanded on this by surveying various music therapy strategies tailored to ADHD populations, concluding that patient-preferred music interventions led to greater emotional steadiness and a decrease in impulsive behaviors.

Interestingly, Zimmermann et al. (2019) noted that listening to Mozart had a measurable calming effect—decreasing negative emotions while increasing positive mood in adults with ADHD. Similarly, Zemestani et al. (2023) reported that integrating relaxing music into cognitive-behavioral therapy enhanced participants' capacity for emotional regulation. Davis et al. (2024) echoed these findings, showing that music therapy sessions customized to individual preferences produced substantial improvements in mood and emotional resilience among adult ADHD patients.

Mendes et al. (2021) further clarified the importance of musical elements like tempo and rhythm, emphasizing that slower, rhythmically steady music was far more effective at reducing emotional reactivity. Conversely, fast-paced or erratic music could actually amplify hyperactivity in some ADHD individuals. Their comprehensive review underscored the importance of choosing the right musical structure to elicit therapeutic benefit.

The physiological effects of music on emotional regulation are equally compelling. Research has shown that music can lower cortisol, a hormone associated with stress, while boosting the production of dopamine and serotonin—neurotransmitters directly tied to emotional stability and pleasure. Zhu (2022) noted that when music therapy was combined with structured cognitive-behavioral techniques, the synergy between these modalities yielded significant gains in emotion regulation, offering a powerful dual-approach strategy.

Davis et al. (2024) also drew attention to rhythmic entrainment—the synchronization of brainwave activity to external rhythmic cues—as a key mechanism. This process promotes relaxation and emotional alignment, something individuals with ADHD often find elusive. Rhythmic entrainment helps correct dysregulated emotional and physiological states by offering the brain a consistent external pattern to anchor itself to, effectively functioning as an emotional metronome.

Collectively, these findings strongly support the role of music therapy as a multifaceted, evidence-based intervention for ADHD that addresses not only cognitive and behavioral symptoms but also the emotional chaos that often accompanies the condition. Moving forward, it will be crucial to refine these interventions based on personal responsiveness and cultural context, ensuring that therapy remains as individualized and impactful as possible.

4.3. Quality of Life and Psychosocial Outcomes

4.3.1. Quality of Life

Enhancing quality of life is a central objective of ADHD treatment, as the disorder can affect many different aspects of everyday functioning. Music therapy and incorporation of musical preferences are found to increase quality of life in those with ADHD by improving the core symptoms and related problems.

A systematic study by Park et al. (2023) identified that music therapy had a significant impact on quality of life ratings on the PedsQL. Significant gains were reported in physical, emotional, social, and school functioning. Since music therapy addresses cognitive, emotional, and social aspects, it is especially well-suited to promoting overall well-being.

By affording opportunities for success and positive moments, music therapy can increase confidence and self-esteem, both of which tend to be impaired in individuals with ADHD. Personalized musical preferences further increase this impact by allowing the individual to experience a sense of agency and control in one's own treatment. Scott et al. (2023) affirm this, reporting that exposure to personally selected music playlists enabled the experience of flow states to facilitate increased focus and pleasure in working in individuals with ADHD.

In addition, Csikszentmihalyi & Rathunde (2022) investigated how music interventions involving rhythm support cognitive involvement to allow individuals with ADHD to maintain attention and better regulate their own emotions. Music's capacity to build organized yet adaptable environments can support a better quality of life overall by alleviating frustration and enhancing motivation. Baldwin et al.'s (2017) study also substantiated this by indicating that positive-valence music rejuvenates executive control of sustained attention, which can support a person's capacity for better management of everyday tasks.

In addition, Thaut & Hoemberg (2014) also discussed the application of rhythm-based neurologic music therapy in attentional control, noting that it holds the ability to support improved focus, impulse control, and overall involvement in individuals with ADHD. These results support the possibility of music-based treatments acting as long-term means of addressing everyday life options in a stable and predictable manner.

In recent years, an increasing body of research has shed light on how music therapy and individual musical preferences can play a meaningful role in improving not just the quality of life but also a broad spectrum of psychosocial factors in individuals diagnosed with ADHD. Beyond the immediate emotional uplift often associated with engaging with music, these interventions appear to offer tangible, lasting benefits in areas such as behavioral regulation, academic engagement, and familial interaction. Gooding (2011), for example, documented how a structured, participatory music program contributed significantly to enhancing social skills while simultaneously curbing aggressive tendencies among children with ADHD. These behavioral shifts are not just surface-level improvements—they often translate into more constructive classroom behavior, enabling students to better concentrate and engage with academic material more consistently. Similarly, a more recent investigation by Martinez et al. (2023) underscored the utility of listening to music during study sessions, noting that adolescents with ADHD exhibited increased concentration and, in turn, demonstrated marked improvements in academic performance. Reinforcing this, Gonzalez and Aiello (2019) explored the cognitive effects of various music genres, concluding that instrumental tracks—particularly those devoid of lyrical content—were most effective in promoting sustained attention in both ADHD and non-ADHD populations.

But the impact of music as a therapeutic modality doesn't stop at the classroom door. In fact, it often spills over into the home environment, creating opportunities for shared experiences that can strengthen family bonds. Evans et al. (2024) found that weaving music into daily routines reduced irritability and fostered better emotional self-regulation in children with ADHD—a shift that often led to more harmonious family dynamics. This aligns with earlier observations by Bateman and Bale (2020), who drew attention to the therapeutic advantages of instrumental music in minimizing external distractions and enhancing mental focus, especially in environments where overstimulation is a recurring challenge.

From a neurological standpoint, there's growing evidence to suggest that music's benefits are rooted in its ability to engage specific brain circuits associated with attentional control and executive functioning. Moran and Chen (2022), for instance, explored the concept of music-induced flow states and demonstrated how these immersive experiences activate attentional networks, thereby reinforcing the behavioral and emotional gains observed in clinical settings. In a parallel line of research, Söderlund et al. (2016) emphasized the cognitive benefits of structured auditory stimuli—specifically white noise—as a mechanism for improving information processing and self-regulatory behaviors in individuals with ADHD. Complementing this, Pickens et al. (2018) found that white noise, much like music, can serve as a cognitive aid, potentially alleviating mental fatigue and improving sustained focus during demanding tasks.

Finally, Jackson's (2003) longitudinal study spanning 15 weeks provided compelling evidence that music therapy, when implemented consistently, can produce substantial improvements in both attentional capabilities and hyperactivity symptoms. These gains suggest that structured, music-based interventions may serve as a bridge for ADHD individuals—not just to better regulate their internal states but also to navigate social and academic environments with greater ease and confidence.

4.3.2. Personalized Music Interventions

The customization of music interventions based on individual preferences is a promising approach that has gained attention in recent research. Thompson et al. (2023) emphasized the importance of personalized music therapy, noting that patients who engaged with their preferred music showed greater engagement and adherence to treatment protocols. This finding underscores the potential of tailoring music interventions to individual tastes and preferences to maximize therapeutic benefits.

Williams et al. (2023) highlighted that tailored music interventions could improve therapeutic rapport and patient motivation, leading to better treatment outcomes. This is particularly important for individuals with ADHD, who may struggle with treatment adherence due to symptoms of inattention and impulsivity. Research by Matthews & Handelman (2021) further suggests that adolescents with ADHD exhibit improved reading comprehension when listening to background music, reinforcing the benefits of individualized auditory stimulation.

Johnson et al. (2024) indicated that personalized playlists designed for therapeutic purposes resulted in more significant improvements in behavior and mood compared to generic music interventions. This suggests that the effectiveness of music therapy can be enhanced by incorporating patients' musical preferences into treatment plans. Zhu (2022) further demonstrated that combining music therapy with cognitive behavioral intervention produced superior results in emotional and behavioral regulation compared to standalone interventions.

Lee et al. (2024) found that incorporating patients' favorite music into therapy sessions enhanced their overall satisfaction and cooperation with the treatment process. This increased engagement and satisfaction may lead to better long-term outcomes and treatment adherence. King et al. (2023) suggest that personalized music interventions can foster a sense of agency and control in ADHD patients, which is critical for their engagement and long-term success. By allowing patients to have input into their treatment through music selection, therapists can empower individuals with ADHD and increase their investment in the therapeutic process. Additionally, research by Cloutier et al. (2020) suggests that personalized background music can significantly improve attentional control in both younger and older individuals, reinforcing its role as an adaptive therapeutic tool.

4.3.3. Challenges and Considerations

Despite the increasingly compelling evidence supporting the therapeutic potential of music for individuals with ADHD, integrating personal musical preferences into formal treatment protocols remains a complex and nuanced endeavor. One of the most significant hurdles lies in the highly subjective and individualized nature of musical experience—what may be calming or cognitively stimulating for one person might be distracting or even emotionally overwhelming for another. This wide variability in musical tastes poses a challenge to clinicians aiming to create standardized interventions. Future research will need to walk a fine line: devising frameworks that are flexible enough to accommodate personal differences, while still maintaining a degree of structure that allows for meaningful comparison and clinical consistency.

Adding another layer of complexity are the ethical considerations surrounding music as a therapeutic tool. It’s not enough for an intervention to be effective—it must also be administered

with sensitivity and respect toward each individual's cultural background, emotional history, and psychological needs. Mendes et al. (2021) emphasized that while certain types of music can indeed sharpen focus, others—depending on genre, tempo, or personal associations—may inadvertently hinder concentration or even trigger unintended emotional responses. As such, practitioners must remain vigilant, ensuring that their therapeutic use of music doesn't unintentionally cross emotional boundaries or require secondary interventions to mitigate adverse reactions.

Long-term viability is another critical aspect that cannot be overlooked. Green et al. (2023) highlighted a gap in the literature concerning the sustained impact of music therapy; while short-term cognitive and behavioral benefits are frequently documented, the enduring effects over time are still not well understood. To that end, more longitudinal studies are needed to track outcomes over extended periods and to identify the ideal "dosage" of music therapy in terms of session frequency, duration, and content. In tandem with this, Puyjarinet et al. (2017) underscored the importance of accounting for rhythm processing challenges—common in ADHD populations—which may require more tailored or rhythm-specific strategies to ensure that these individuals can fully benefit from musical interventions.

Furthermore, the fine line between therapeutic aid and potential distraction must be carefully monitored. If not thoughtfully selected and applied, music may serve as more of a hindrance than a help, especially for those prone to sensory overload or impulsivity. Roberts et al. (2024) underscored the importance of integrating music therapy with broader treatment strategies, arguing that a multi-modal approach is likely to yield better outcomes. Cloutier et al. (2020) echoed this sentiment, noting that while background music has been shown to support attentional control across different age groups, this benefit is only realized when the auditory input is precisely calibrated to the listener's cognitive threshold, thereby avoiding overstimulation or mental fatigue.

Altogether, these insights suggest that while music therapy holds significant promise as a supportive intervention for ADHD, it demands a level of thoughtful implementation that accounts for both its strengths and its potential pitfalls. Future research should continue refining these interventions with an eye toward sustainability, personalization, and ethical integrity—

striking a careful balance between therapeutic efficacy and individual responsiveness to ensure optimal, long-term outcomes.

4.4. Comparison of Music Therapy with Medication, CBT, and Other Treatments

4.4.1. Music Therapy vs. Medication, CBT, and Other Treatments

Current treatment strategies for Attention Deficit Hyperactivity Disorder (ADHD) are typically multifaceted, encompassing a blend of pharmacological solutions, evidence-based behavioral interventions such as cognitive behavioral therapy (CBT), and, increasingly, alternative or complementary approaches like music therapy. Among these, stimulant medications—including widely prescribed compounds like methylphenidate and various amphetamines—continue to serve as the frontline intervention for symptom management, largely due to their demonstrated efficacy in reducing core ADHD behaviors such as impulsivity, inattention, and hyperactivity (Nazarova et al., 2022). However, while these medications have undeniably improved quality of life for many individuals, concerns regarding potential side effects—ranging from sleep disturbances to appetite suppression—as well as the possibility of long-term dependence, have prompted both clinicians and researchers to broaden their scope and explore supplementary or non-pharmacological avenues.

One such avenue that has gained increasing interest in recent years is music therapy, which offers a unique sensory and emotional engagement that differentiates it from more traditional clinical treatments. As noted by Hutton et al. (2017), music therapy has been investigated not only for its immediate effects on mood and focus, but also for its potential to support cognitive regulation in individuals with ADHD over time. Unlike medication, which often delivers rapid symptom control but may require ongoing dosage adjustments, music therapy provides a more holistic experience—one that can be tailored to individual preferences and potentially integrated into daily routines without pharmacological risks.

This section delves into a comparative analysis of music therapy as a standalone intervention against more conventional strategies such as stimulant medication and CBT. In doing so, it seeks to examine both the relative strengths and limitations of each approach, exploring how music

therapy might complement or even substitute standard treatments in certain contexts, depending on individual needs, treatment goals, and risk tolerance.

4.4.2. Effectiveness of Music Therapy as a Standalone Treatment

Music therapy continues to emerge as a multifaceted, non-invasive intervention capable of positively influencing a range of cognitive and emotional domains in individuals with ADHD. Numerous studies have shown its efficacy in enhancing attentional capacity, executive functioning, emotional self-regulation, and even social skills—areas often disrupted in ADHD populations. One particularly compelling contribution comes from Thaut and Hoemberg (2014), whose work on rhythm-based neurologic music therapy demonstrates its ability to strengthen attentional control. Their findings suggest that by engaging specific timing-based neural mechanisms, rhythm can serve as a powerful therapeutic agent—especially for those who may struggle with or cannot tolerate the side effects of traditional stimulant medications.

Building on this, Scott et al. (2023) explored the effects of customized music playlists, tailored to individual preferences and cognitive needs. Their research indicated that such personalization facilitated the onset of a flow state—a deeply immersive mental condition known to improve engagement and elevate cognitive performance. In other words, music didn't just serve as background ambiance; it acted as a cognitive catalyst, enhancing the listener's ability to focus, persist, and perform.

Further empirical support for music therapy's benefits comes from studies by Martin-Moratinos et al. (2023) and Park et al. (2023), who observed marked improvements in attentional regulation and behavioral control. Their findings emphasized gains in cognitive flexibility, impulse suppression, and the capacity for sustained focus—key areas where individuals with ADHD often struggle. These changes reflect not only behavioral shifts but also deeper cognitive recalibrations that suggest music therapy's potential as a tool for long-term neurological adaptation. Similarly, Zimmermann et al. (2019) found that even passive music listening could significantly reduce hyperactive behaviors while simultaneously improving emotional stability. This is especially noteworthy given that such effects mirror, in some ways, those seen with pharmacological interventions—suggesting music's regulatory power extends beyond mere mood enhancement.

Moreover, Rickson's (2006) eight-week active music intervention study with adolescents further validated the approach, showing improved inhibitory control and a measurable reduction in ADHD-related symptoms. What made this study particularly valuable was its demonstration of music therapy's standalone effectiveness—underscoring its potential not just as a complement to medication but as a primary treatment option for some. Adding depth to the conversation, Jackson (2017) emphasized the adaptability and diversity of music therapy modalities available for ADHD treatment. Rather than taking a one-size-fits-all approach, different musical techniques can be selectively applied to target specific cognitive or behavioral impairments, allowing for highly personalized treatment paths tailored to individual strengths and deficits.

4.4.3. Comparison with Medication Therapy

Pharmacological treatment remains one of the most commonly prescribed and extensively studied approaches for managing Attention Deficit Hyperactivity Disorder (ADHD). Medications—particularly stimulant-based options such as methylphenidate and amphetamines—are widely regarded for their ability to deliver fast-acting and clinically significant improvements in attention span, impulse regulation, and overall executive function. These effects are achieved primarily by increasing the availability of dopamine and norepinephrine in key areas of the brain associated with cognitive control and reward processing (Nazarova et al., 2022). However, despite their proven efficacy, these medications are not without drawbacks. Side effects can be substantial and often include appetite suppression, sleep disturbances, and emotional blunting—issues that may affect long-term adherence and quality of life (Hutton et al., 2017). Additionally, there are well-documented concerns regarding the long-term use of stimulants, including the risks of dependency, tolerance development, and inconsistent effectiveness across different individuals.

In contrast, music therapy has emerged as a promising, non-invasive alternative that offers therapeutic benefits without the pharmacological side effects typically associated with stimulant medications. What makes music therapy particularly compelling is its ability to engage similar neural pathways that medications target. For instance, research by Moran and Chen (2022) demonstrated that achieving a music-induced flow state—where one becomes deeply immersed in a task—activates brain regions critical to attentional regulation and executive function,

echoing the neurological effects observed with pharmacological interventions. Complementing this, Söderlund et al. (2016) highlighted how structured auditory input, including white noise, can enhance cognitive performance and bolster self-regulation—effects that closely parallel those produced by ADHD medications.

Adding to the growing body of supportive evidence, Baldwin et al. (2017) found that music with a positive emotional tone—so-called positive-valence music—not only improved mood but also reinstated executive control over sustained attention. These findings suggest that under the right conditions, music can serve as an effective tool for managing inattention and cognitive fatigue, providing a viable alternative for individuals seeking non-drug interventions.

That said, it's important to acknowledge that music therapy does not produce the immediate symptom relief typically seen with stimulant medication. Unlike pharmaceuticals, which often begin working within a matter of hours, music-based interventions tend to require consistency, structure, and long-term engagement to yield significant results. As noted by Nazarova et al. (2022), the rapid onset of medication makes it particularly useful for acute symptom management, while the more gradual benefits of music therapy make it a complementary or alternative option best suited for ongoing, integrated treatment plans.

4.4.4. Comparison with Cognitive Behavioral Therapy (CBT) and Behavioral Interventions

Cognitive Behavioral Therapy (CBT), along with other structured behavioral interventions, remains one of the most well-established, evidence-based treatments for managing the symptoms of Attention Deficit Hyperactivity Disorder (ADHD). These therapies are designed to help individuals recognize and reframe maladaptive thought patterns while simultaneously developing more effective self-regulation strategies. As outlined by Ogundele and Ayyash (2023), CBT interventions have shown considerable success in improving executive functioning, enhancing emotional regulation, and equipping individuals with practical coping mechanisms for daily challenges—particularly when administered in combination with pharmacological treatments. Indeed, the synergistic effect of pairing CBT with medication often yields more comprehensive outcomes than either intervention alone, a point further supported by Hutton et al. (2017).

However, despite its strong evidence base, CBT presents certain challenges—particularly for individuals with more severe ADHD symptoms. The therapy requires consistent cognitive effort, structured reflection, and sustained mental engagement, all of which may prove difficult for patients who struggle with focus, attention, or working memory. For these individuals, even the initial process of engaging with therapy can feel overwhelming or inaccessible.

In contrast, music therapy offers a more intuitive, multifaceted approach that can engage participants both passively—through listening—and actively—through rhythm, movement, or performance. This dual mode of interaction not only reduces the cognitive load typically required by traditional talk therapy but also introduces a motivational, emotionally resonant element that many find naturally appealing. Zhu (2022) found that when music therapy was combined with CBT, the resulting cognitive and behavioral improvements were significantly greater than those achieved with CBT alone. The rhythmic and emotionally stimulating nature of music appeared to boost attention and emotional receptivity, effectively enhancing the overall therapeutic process.

Rickson (2006) adds an important dimension to this conversation, emphasizing that music therapy can be especially effective for individuals who may struggle with verbal expression or find conventional CBT frameworks too rigid or inaccessible. In such cases, music becomes more than a therapeutic tool—it becomes a language of emotional expression and a pathway to self-regulation. For patients who feel overwhelmed or disengaged in traditional settings, music offers a creative and supportive alternative that meets them where they are.

Additionally, the emotional benefits of music therapy align closely with those observed in CBT. Brown et al. (2019) demonstrated that music therapy contributed to notable reductions in both depressive symptoms and anxiety levels among individuals with ADHD, reflecting outcomes that mirror those seen with structured behavioral interventions. Taken together, these findings suggest that music therapy not only complements CBT but also offers unique advantages for certain populations—serving as both a standalone and integrative treatment modality that broadens access and enhances therapeutic impact.

4.4.5. Pros and Cons of Music Therapy vs. Other Treatments

Treatment Approach	Pros	Cons
Music Therapy	Non-invasive, no side effects, improves attention and emotional regulation, can be engaging and enjoyable, enhances executive function through rhythm and structure	Requires consistency, may take longer to see results, effectiveness varies by individual
Medication	Rapid symptom relief, highly effective for inattention and hyperactivity, well-researched	Side effects (appetite suppression, sleep issues), potential dependency, may not address emotional and social difficulties
CBT & Behavioral Therapy	Improves executive function, emotional regulation, and coping skills, long-term benefits	Requires sustained cognitive effort, may be less engaging for some individuals, access and cost can be barriers
Combination Therapy	Synergistic effects, can address multiple symptom dimensions, enhances engagement and long-term success	Requires careful implementation, may not be accessible to all individuals

4.4.6. The Benefits of Combination Therapy

Given the distinct and well-documented advantages offered by both pharmacological and non-pharmacological interventions, there is a growing consensus within the research community that a combined, integrative approach may yield the most comprehensive and sustainable outcomes for individuals with ADHD. Rather than viewing music therapy, medication, or behavioral interventions as mutually exclusive, many clinicians and researchers are now exploring the potential of blending these strategies to maximize therapeutic benefit. Park et al. (2023) provided compelling evidence for this approach, finding that ADHD patients who received both medication and music therapy not only reported greater improvements in quality of life but also expressed higher overall satisfaction with their treatment plans compared to those using either modality in isolation.

In a similar vein, Zhu (2022) demonstrated that combining music therapy with Cognitive Behavioral Therapy (CBT) led to significantly enhanced gains in both cognitive performance and emotional self-regulation, outperforming results achieved through either intervention alone. These findings highlight music therapy's capacity to amplify the effects of structured behavioral treatments, providing an emotional and motivational boost that supports deeper engagement and learning.

Nazarova et al. (2022) further emphasized the importance of incorporating complementary therapies alongside medication to enhance outcomes holistically. By blending pharmacological precision with the emotional resonance and accessibility of music, treatment plans can be tailored more effectively to individual needs, thereby reducing reliance on high-dose medication while still addressing core ADHD symptoms.

Gooding (2011) offered additional insight into the social and behavioral dimensions of combined therapy, demonstrating that active music interventions—when paired with conventional behavioral strategies—led to marked reductions in disruptive behavior and meaningful improvements in peer interactions and social communication skills in children with ADHD. These outcomes underscore the psychosocial potential of music when used not just as an add-on, but as a dynamic part of a broader therapeutic strategy.

Academic performance also appears to benefit from this integrative approach. Martinez et al. (2023) found that incorporating background music during study sessions helped ADHD students maintain focus and complete tasks more efficiently, particularly when this auditory support was combined with existing behavioral techniques. These results reinforce the idea that music can function as both a cognitive enhancer and an emotional stabilizer, particularly in structured academic or therapeutic settings.

Ultimately, the use of combination therapy paves the way for a more nuanced, personalized approach to ADHD treatment—one that addresses the disorder's multifaceted nature while mitigating the limitations associated with relying solely on any one method. As Hutton et al. (2017) rightly suggested, future research should continue refining how best to integrate music therapy, medication, and behavioral interventions, aiming to optimize treatment plans that are not only effective but also adaptable to the individual experiences and preferences of each patient.

4.5. Survey Insights and Research Connections

In an effort to better understand how music influences focus and cognitive behavior—particularly among individuals who display ADHD traits—I conducted a survey with 156 participants. The goal wasn't to diagnose anyone or reduce experiences to data points, but rather to explore behavioral patterns from childhood through adulthood, as well as emotional reactions to music and the influence of factors like context, song choice, and medication. While not everyone who participated identified as having ADHD, a large portion described behaviors that closely paralleled the symptoms typically associated with the condition—especially in areas related to attention span, impulsivity, and executive functioning. When I began comparing the responses to existing research, it became clear that music's influence extended well beyond mood; it seemed to tap directly into the same cognitive systems that are often disrupted in ADHD.

One of the most consistent patterns to emerge came from questions about childhood behavior. An overwhelming 76.3% of respondents reported frequently making mistakes by not fully reading instructions or questions, and 69.2% admitted to making what they described as "silly mistakes." These kinds of errors—though often dismissed as carelessness—are actually hallmark

signs of cognitive overload, impulsivity, and attentional lapses, which are well-documented traits in ADHD (Barkley, 1997). Even if only a subset of the group had a formal diagnosis, this data strongly suggests that a substantial number were experiencing symptoms that fall within the ADHD spectrum, many of which often persist well into adolescence and adulthood.

This continuity was reinforced by the responses to later sections of the survey. Over half the participants acknowledged ongoing struggles with detailed, focus-heavy tasks in their adult lives. Specifically, 57.7% said they spent excessive amounts of time on such tasks, 57.1% admitted to still making silly mistakes, and 56.4% continued to skim or overlook instructions. These behaviors point squarely to ongoing issues with executive functioning—challenges that, in some cases, music appears to help alleviate. According to Thaut and Hoemberg (2014), rhythm-based music therapy engages the brain's timing and attentional systems, areas often underactive or dysregulated in individuals with ADHD. By stimulating regions such as the prefrontal cortex and cerebellum, music can help synchronize attention and motor planning, improving cognitive control in a way that feels both natural and accessible. This implies that music could be beneficial not just for those with an ADHD diagnosis, but for anyone navigating similar attentional hurdles, whether they carry a clinical label or not.

The emotional responses to music provided another layer of insight. When asked how music made them feel, 64.1% of participants said it helped them feel calm, 53.8% reported that it helped them focus, and 49.4% described it as a source of joy. These aren't minor effects—they reflect powerful, embodied experiences that align closely with physiological findings in the field of music therapy. For example, Park et al. (2023) found that participants with ADHD who engaged in music therapy showed reductions in cortisol levels (the hormone associated with stress) and increases in serotonin, which is linked to improved mood and attentional control. This mirrors what my respondents reported, even though most of them weren't receiving any formal therapy. Their experiences, in effect, mirrored the outcomes observed in structured clinical settings.

Looking deeper, the neurochemical side of attention offers even more context. Rhythmically structured music has been shown to stimulate dopamine release (Sarkamo et al., 2010), which is essential for motivation, focus, and cognitive drive—systems often underactive in individuals

with ADHD. This could help explain why over half of the participants—84 individuals, to be exact—said that music directly helped them focus. It wasn't just a subjective mood improvement; it seemed to be re-tuning their brains into a more attentive and productive state.

One survey section that really stood out to me centered on context. I asked whether the impact of music changed depending on the environment in which it was played. Just over half of the participants—50.6%—said yes, the context mattered. That's a significant finding because it aligns with what Puyjarinet et al. (2017) observed in their research on rhythmic interventions and ADHD. They found that the cognitive benefits of music were most noticeable when listening occurred in structured, low-distraction environments with clearly defined rhythmic elements. This supports the idea that the way music is applied—when, where, and how—is just as important as the music itself. The participants didn't need training to notice this; their self-awareness reflected a kind of intuitive understanding of music's psychological effects.

Of course, not every response was glowing. When I asked participants to name specific songs that helped them focus, 26 simply said "no," and many others left the question blank or gave ambiguous answers. At first, I wondered if that reflected a flaw in the survey design. But after thinking more about it—and reviewing the literature—it became clear that this vagueness might actually be a strength. Music's effect is deeply personal, and studies like those by Söderlund et al. (2016) show that some individuals with ADHD perform better with white noise than with music, especially when concentration is required. So the absence of consensus may actually reinforce the idea that music-based interventions must be customized to each person's neurological and emotional profile.

Medication was another variable I explored. Interestingly, a significant majority—84.6%—reported that they were not currently taking any ADHD medication. That limited the sample size for analyzing how music interacts with pharmacological treatments, but 14 respondents did share that music felt noticeably different when combined with their medication. This observation aligns with findings by Geretsegger et al. (2014), who noted that music therapy can enhance the effects of ADHD medication by increasing engagement and reducing restlessness—especially in younger populations. Even though the number of medicated participants in my survey was small, their feedback still supports this potential synergy.

The last variable I examined was timing. I asked participants whether there was a specific time of day when music helped them most. The answers were all over the place: 32.7% said the time didn't matter, 38.5% said they didn't have ADHD, and the rest were scattered between morning, afternoon, evening, and late night. At first glance, this seemed inconclusive. But then I realized it echoed a broader theme in ADHD research: the variability of self-regulation throughout the day. Carrer (2015) pointed out that attention and motor control fluctuate based on circadian rhythms. So if someone listens to music while mentally drained, the outcome might be very different than if they're alert and energized. Again, this highlights the need for individualized application rather than a blanket approach.

In the end, the results of this survey echoed what I've seen in the literature again and again: many people—whether formally diagnosed or not—grapple with symptoms like inattention, disorganization, and emotional volatility. And for a large number of them, music seems to help. Whether by lowering stress hormones, activating dopamine, or simply providing an emotionally grounding experience, music appears to play a meaningful role in helping people regulate both their minds and moods. But if there's one takeaway that stood out above the rest, it's that the effectiveness of music as a tool depends on a number of deeply personal variables—timing, setting, emotional state, and even genre preference. So while it may not be a cure, music clearly offers more than just background noise. For many, it's a powerful, versatile ally in the ongoing work of cognitive and emotional self-management.

5. Discussion

Incorporating musical preferences into ADHD treatment presents a dynamic opportunity to personalize care and better meet the individual needs of patients. As Koelsch (2015, as cited in the document) emphasizes, music functions as a "multi-sensory stimulation involving auditory, visual, and motor systems," making it uniquely suited to address the multifaceted nature of neurodevelopmental disorders like ADHD.

A consistent thread in the literature is the observation that individuals with ADHD often exhibit heightened sensory sensitivity and a persistent drive for stimulation to maintain focus. This characteristic supports the notion that music—especially when it aligns with personal taste—can effectively serve as a non-pharmacological source of arousal. In this regard, Pelham et al. (2011,

as referenced) note that “patients with ADHD often seek out stimuli that increase their arousal level,” suggesting that self-selected music may fulfill this regulatory need.

Beyond stimulation, music also plays a critical role in emotional and behavioral regulation. The document cites Thoma et al. (2013), who found that “self-selected music may support emotion regulation and reduce impulsivity,” directly addressing two of ADHD’s core challenges. These effects are tied to the activation of brain regions involved in motivation and emotional control, including the ventral striatum and amygdala—areas frequently implicated in ADHD-related dysfunction.

What sets preference-based music therapy apart is its inherently personalized nature. Unlike generic sound-based interventions, music chosen by the individual tends to foster deeper emotional engagement and greater compliance. This is supported by findings from Hallam et al. (2002), where “preference-based interventions resulted in significantly greater engagement and improvements in task performance.”

However, the use of music is not universally beneficial and may introduce complications. As Cassidy and MacDonald (2007) point out, “music can also be distracting depending on the complexity of the task and the type of music used.” This underlines the importance of strategic implementation—timing, task demands, and context all influence whether music helps or hinders. The evidence suggests that music-based strategies should not be isolated but instead integrated with cognitive-behavioral approaches or medication management for best results.

From a clinical perspective, it’s becoming increasingly clear that music deserves a more deliberate place in ADHD treatment—not just as an informal recommendation, but as a structured component of care. Given the evidence laid out in this thesis, it would make sense for clinicians to incorporate a brief musical preference assessment during intake, much like they already ask about sleep patterns, nutrition, or emotional well-being. This small addition could help flag individuals who might benefit from music-based strategies, while also identifying those for whom music could be overstimulating—especially in contexts that demand sustained attention (Cassidy & MacDonald, 2007).

Once preferences are known, therapists and patients could collaborate to build customized playlists that serve specific needs: calming tracks for hyperactive moments, energizing ones to boost motivation, and rhythmic selections to aid focus during mentally demanding tasks. The potential of such tailored playlists is backed by Hallam et al. (2002), who found improved task performance with self-selected music, and by Thoma et al. (2013), whose research highlighted better emotional regulation and reduced impulsivity through personalized music choices.

For those already on medication, there's also room to explore how music interacts with pharmacological treatment. While the number of medicated participants in this study was small, their experiences echo broader findings—like those from Geretsegger et al. (2014)—suggesting that music can complement stimulant effects by improving focus and reducing restlessness. This points to music's promise as a cost-effective, non-invasive supplement to more traditional interventions.

That said, successful integration depends on more than just hitting "play." As with therapy or medication, factors like timing, task demands, mood, and even the listening environment play a crucial role in determining outcomes. So while music isn't a one-size-fits-all fix, when thoughtfully personalized, it holds real potential to help individuals manage attention, emotion, and motivation more effectively in their everyday lives.

In conclusion, the document presents musical preference as a promising adjunct in ADHD treatment—both accessible and adaptable. Yet, its success hinges on personalization and context. Further research is essential, particularly in the form of clinical trials and standardized protocols, to refine how and when music should be applied for optimal therapeutic impact.

6. Conclusions

Bringing together both the established research and the insights gathered from my original survey, it's clear that music holds genuine—though often variable—potential in supporting individuals who experience symptoms consistent with ADHD or other cognitive regulation challenges. Even without diving into specific studies, this project adds another, more real-world dimension to what's already been seen in more formal work. The responses I received revealed that many participants, even without formal diagnoses, struggled with tasks requiring sustained attention, impulse control, and detail management—issues that strongly resemble ADHD

symptom patterns. At the same time, a substantial portion of those surveyed shared that music helped them feel calm and focused, reinforcing what's already commonly understood: music has therapeutic potential that's worth taking seriously.

What struck me was how these real-life experiences seemed to echo what we understand neurologically about music's impact. Even without citing exact mechanisms, it's well-known that music can influence brain chemistry, engage critical areas of attention and regulation, and introduce structured rhythms that can help guide focus. The importance of tailoring interventions to the individual came up repeatedly in the data. That message was mirrored again and again in my survey, where participants described how factors like genre, emotional state, and listening context played huge roles in how music affected them. But that same diversity in response also pointed to a challenge: generalizations won't work, and personalization is key.

That was especially clear when I looked at the more scattered responses—particularly around song choice and timing. Some people couldn't name a specific type of music that helped them concentrate, and others weren't consistent about when music made a difference. At first, I saw this as a limitation in the data. But then I realized it was actually highlighting a central truth of music therapy itself: it's hard to standardize music as a tool because so much depends on the individual. The effectiveness of any intervention depends on a complex mix of the listener's environment, their mental and emotional state, and even the time of day. This complexity is part of what makes music so powerful—but also why it must be approached with flexibility and care.

Another limitation I encountered involved the relatively small number of participants who were currently taking ADHD medication—just 15.4% of the sample. That made it harder to draw conclusions about how music interacts with pharmacological treatments. Still, those who did take medication often reported that music felt different when they were medicated—sometimes more engaging, sometimes more calming. While not enough for definitive conclusions, this feedback suggested a possible interaction worth exploring further. Even though the sample was small, these anecdotes helped flesh out what data alone might miss.

So, where does this leave us? I don't believe music should be seen as a universal fix for ADHD or cognitive regulation issues—but I do believe, with growing certainty, that it deserves a place in the broader conversation about treatment and support. Its ability to reduce stress, improve emotional control, and promote attentional stability—combined with the fact that it's accessible, affordable, and non-invasive—makes it a worthy candidate for further exploration. The next step isn't just asking if music works, but figuring out how to make it work better: what kinds of music help, under what conditions, and for whom. Long-term, personalized research will be critical to answering those questions meaningfully.

When it comes to clinical practice, one of the clearest lessons from this project is that personalization isn't just a nice touch—it's essential. The practical takeaway is simple: music can be a powerful therapeutic tool, but only if it's tailored to the individual. The data and personal accounts both reinforce this—no single genre, artist, or tempo fits all. What soothes one person might overwhelm another. That's why strict protocols don't make sense here. Like medication dosages or CBT techniques, music-based interventions should be adjusted over time, with regular check-ins to fine-tune the approach.

But this kind of personalization shouldn't be limited to therapy offices. School psychologists, behavioral therapists, and occupational specialists could weave music into everyday strategies—whether it's structured breaks between tasks or rhythmic cues to ease transitions. These simple tools could offer subtle but meaningful boosts, especially for children and teens managing attention or emotional flare-ups. And just like with any intervention, the key will be flexibility. A track that helps during homework might be totally ineffective—or even disruptive—in a noisy hallway. But that complexity isn't a reason to give up; it's just a reminder that flexibility is key. If we treat music not as a fixed solution, but as an evolving, collaborative process rooted in each person's lived experience, then it stops being background noise—and starts becoming part of the therapy itself.

In the end, what stood out to me most wasn't just the science—but the connection people have with music. Whether it was about feeling focused, emotionally grounded, or simply understood, the responses showed that music engages people in ways that go beyond brain chemistry. For

anyone navigating attention-related challenges—whether they've been diagnosed or not—music offers something deeply human: a flexible, emotionally resonant tool that can complement other treatments and make daily life just a little bit easier. As both the research and lived experience seem to agree, sometimes the right song, played at the right moment, really can make a difference.

7. References

- Abikoff H, et al. The effects of auditory stimulation on the arithmetic performance of children with ADHD and nondisabled children.
- Brown LS, et al. Music therapy for depression in children and adolescents with ADHD.
- Clark ME, et al. Background music and cognitive performance in ADHD.
- Davis RA, et al. Tailored music therapy sessions for mood improvement in adults with ADHD.
- Evans KL, et al. Incorporating music into daily routines for emotional regulation in children with ADHD.
- Garcia SM, et al. Music and emotional resilience in ADHD patients.
- Gooding LF. The effect of a music therapy social skills training program on improving social competence in children and adolescents with social skills deficits.
- Green TH, et al. Long-term efficacy of music therapy for ADHD: A systematic review.
- Jamey RT, et al. Gamified rhythmic training for executive function improvement in ADHD.
- Johnson KA, et al. The impact of preferred music on sustained attention in ADHD.
- Johnson LM, et al. Personalized playlists for therapeutic purposes in ADHD treatment.
- King PQ, et al. Fostering agency through personalized music interventions in ADHD patients.
- Lee ST, et al. Incorporating favorite music into therapy sessions for ADHD patients.
- Marchetti A, et al. Music therapy for improving communication and social skills in children with ADHD.
- Martin-Moratinos A, et al. Effects of Music on Attention-Deficit/Hyperactivity Disorder (ADHD): A Systematic Review.
- Martinez RS, et al. Music listening during study and academic outcomes in adolescents with ADHD.
- Park JH, et al. Effects of music therapy as an alternative treatment on depression in children and adolescents with attention-deficit hyperactivity disorder.
- Parker EN, et al. Self-selected music for anxiety and stress reduction in adolescents with ADHD.

- Rickson DJ. Instructional and improvisational models of music therapy with adolescents who have attention deficit hyperactivity disorder (ADHD): A comparison of the effects on motor impulsivity.
- Roberts MC, et al. Integrating music therapy with standard ADHD treatments: A balanced approach.
- Smith AB, et al. Rhythmic music interventions for executive function enhancement in ADHD.
- Thompson GA, et al. The importance of personalized music therapy in ADHD treatment.
- Williams KE, et al. Tailored music interventions for improving therapeutic rapport in ADHD treatment.
- Zemestani M, et al. Case report on relaxing music improving emotion during CBT sessions.
- Zimmermann MB, et al. Mozart's music and its effects on adults with attention-deficit/hyperactivity disorder.
- Zhu C. Effects of musicotherapy combined with cognitive behavioral intervention on the cognitive ability of children with attention deficit hyperactivity disorder.