

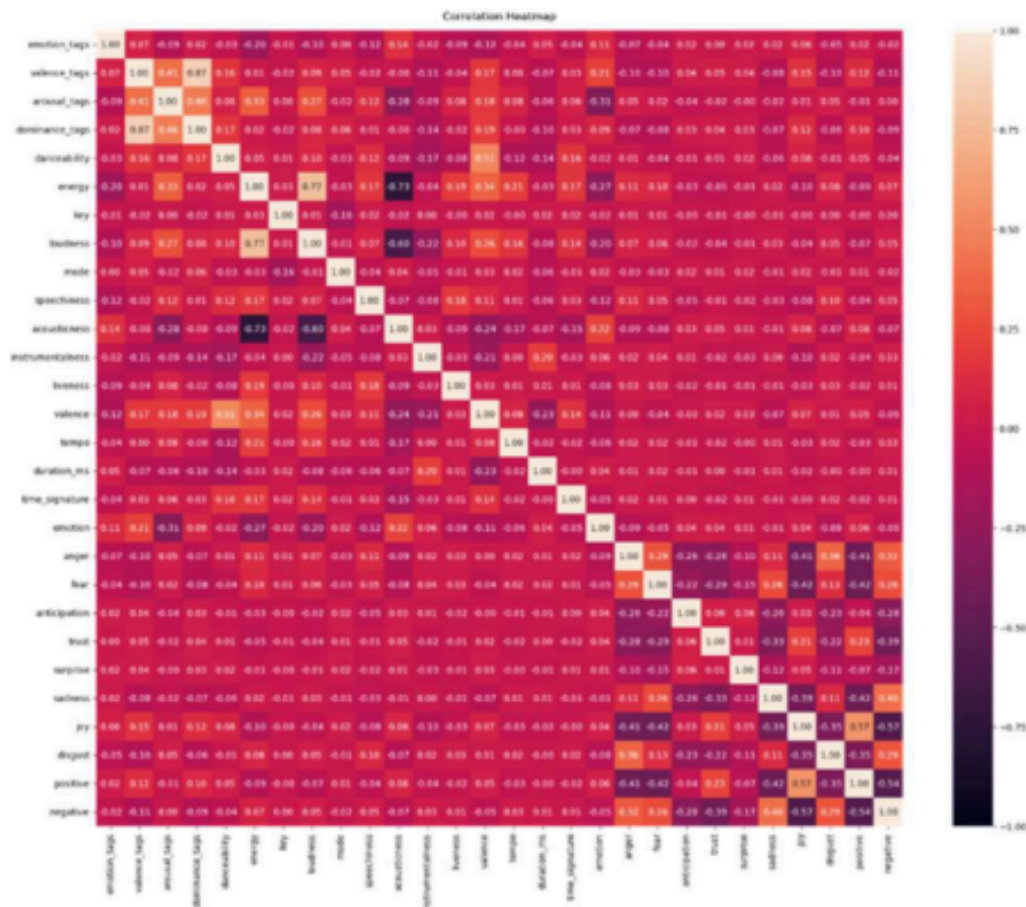
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Speakers That Bump Hearts

Although we listen to it every day, we rarely stop to think about why music is so entrancing. Every song has a certain magic that keeps us coming back for more. Whether we're relaxing, working, studying, or partying, our emotions are constantly shifting throughout the day. Music is a useful tool for smoothing out these transitions; it can even evoke nostalgia for past experiences and shift our perspective. Music has become more accessible than ever and holds a significant cultural presence, especially among teenagers. Not only does music occupy the public dialogue, but it also consistently influences our emotions and occupies the back of our minds. This strong, underlying connection makes music a powerful tool that can be harnessed for positive impact by both mental health professionals and individuals without access to professional care. By combining emotion recognition and targeted listening treatment, music can improve the mental health of young adults and adolescents while developing healthy emotion regulation habits.

Music's powerful effects are achieved through two mediums: abstract forms of words and notes (Lee 1). While many past efforts have been made to classify emotion in songs, music has become more complex with time. Modern songs often feature a wide gap between lyrical content and melodic tone. One example is "Not Today" by Twenty One Pilots, an extremely catchy tune with an upbeat rhythm in a major key. However, the lyrics convey a melancholy lament about depression and lack of motivation. The song even explicitly nods to this emotional irony: "This one's a contradiction because of how happy it sounds/But the lyrics are so down" (Twenty One Pilots 13-14). Different genres interpret sounds with distinct emotional nuances, and the wide

variety of experimental music makes tracking these patterns challenging. With the rise of machine learning, recent studies have begun classifying emotion in music using neural networks. These complex algorithms are able to adapt to rare music genres, but require precise “feature extraction and dataset quality” to achieve a high “accuracy” (Lee 2). With both audio and lyrical algorithms combined, researchers have developed a model with an impressive 98.79% accuracy (Agarwal Table 6). The results of these studies have been summarized to create a table showing the relationship between certain musical qualities and the emotions they evoke. (Lee Fig. 4).



This data would be valuable in creating a reverse search tool for music based on emotion. Such a tool would return song recommendations based on an input of emotional keywords rather than genre or audio similarity. If this application were developed to recommend

music based on specific emotional goals, it could aid in managing emotions—a process often referred to as emotion regulation.

Emotion regulation (ER) is when individuals use “interactive,” “goal-oriented” methods to initiate a shift in mood. It can strengthen emotions users label as ‘good’ or diminish ‘bad’ emotions (Peters 554). We engage in this process on a daily basis, both implicitly and explicitly. An implicit form of ER would be daydreaming, which the brain automatically uses to reduce boredom. An explicit example is meditation, which is often practiced to remain calm and reset the mind from negative thoughts. Emotion regulation is a skill that can be developed through therapy and guided practice:

The primary window for ER occurs during infancy, toddlerhood, and preschool years, and atypical ER is a risk factor associated with mental health problems. ER skills are linked to higher social competence, more prosocial behavior, and socioemotional adjustment in adolescence. (Peters 555)

Music directly associates with memories, and imagining a song can bring us back to a moment and the emotions tied to it. By creating these links early in life, music can have a lasting impact later on. However, it’s never too late to begin making these connections. With a music search tool, we could find music that aligns with a target emotion, explicitly managing emotions in the present while creating an implicit link between memory and music.

Many studies have attempted to utilize music for emotion regulation, with various methods and environments; however most studies only focused on “reflecting, talking, and writing about the use of music” instead of using “active musicking interventions” to explore the effects of listening to or creating music on emotions (Peters 556). However, one unique

2013 study focused on using music to create a reflective environment for listeners, finding that using “MP3 players...was highly efficient in regulating affect, creating private spaces for listeners to focus on their own emotional states of mind without being influenced by surroundings” (Peters 553). Listeners would choose music that matched either their “current or desired affects,” and the music helped them achieve their target emotional state (Peters 553). However, this study only tracked short-term emotional effects. There is a lack of research on the long-term impact of music on implicit emotional regulation. Because emotion regulation development is most effective in the early years, music plays a significant role in early childhood. Only one large study has ever been conducted on school children using active musicking, with authors noting that “active listening, singing or playing for specific emotion regulation purposes in education or therapy, in schools or clinical settings are rare ... [and] very poorly researched and documented” (Uhlir 2). However, “adolescent participants identified music listening as one of their most important coping strategies, including helping them to deal with life stress” (Peters 556). A meta-study found that “music continues to be used as a coping mechanism related to negative affective states and to achieve desirable moods” (Peters 556). Despite the common use of music as a tool, we know very little about the long-term effects of this strategy. Even though there is a “rarity of existing empirical studies of good quality” on musicking for ER, a meta-study indicated that it has a “moderate impact” (Peters 561). Given their popularity and effectiveness, more research on the long-term effects of these interventions is clearly needed.

Overall, studies fall into two intervention types: *primary* and *complementary*. Primary interventions use music “as a standalone tool to address a mental health outcome,”

emphasizing the “therapeutic capacity of sound, pitch, rhythm, and tempo as a tool to improve emotional wellness” (Rodwin 8). Complementary interventions, in contrast, “serve as an ‘add-on’ component to support...traditional treatment,” and “describe music as a tool to provide an additional outlet for self-expression, social support, and engagement” (Rodwin 8). While both are explicit methods for emotion regulation, *primary* studies focus on simple short-term emotions, whereas *complementary* studies focus on the abstract long-term mental health benefits of music. “Twenty-three out of the twenty-six” (88%) studies on music for emotional regulation in adolescents reported “positive effects that were statistically significant for at least one main outcome” (Rodwin 8). Additionally, “previous systematic reviews and meta-analyses have found similar results for children, younger adolescents, and adults with internalizing disorders (Belski, 2021; Geipel, 2018; Gold, 2004; Maratos, 2008; Tang, 2020)” (Rodwin 8).

These meta-analyses illustrate the numerous potential benefits of music for mental health, including short-term emotion regulation, self-expression, engagement with treatment, and fostering implicit self-regulation habits. However, music is currently underutilized in actual treatment. Many studies “underscore the need to build bridges between researchers, educators, and therapists, to propose applications for real-world contexts, where music might be used as a resource for ER, to contribute to positive adjustment and adaptation and overall well-being” (Peters 556). More studies are needed to examine the long-term effects of music, and “improve the understanding of *how* and *for whom* music-based interventions work” (Rodwin 1). Creating a music search tool based on emotion would assist clinicians in providing goal-oriented emotion regulation musicking in an efficient, cost-effective, and

accessible manner. Rodwin emphasizes the “need for more education, dissemination, and training focused on music and expressive therapies to help clinicians develop the skills needed to use these strategies” (9). Such tools could also consider a user’s previous listening habits to provide personalized recommendations and could benefit individuals without primary care access if they have a clear emotional target. There is currently a shortage of mental health care: many struggle to access it with issues of cost, availability of professionals, or time commitment. Music offers a self-applied, flexible, affordable, and accessible mental health tool that could be integrated with telehealth applications. Mental health is a critical issue for today’s youth—statistics reveal a troubling rise in suicide and depression rates over the past decade. Music already enriches our lives, and could become a key resource for emotional stability in the face of life’s challenges. Let’s make it happen.

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