

MEASUREMENT OF MUSICAL IDENTITY TO TAILOR MUSIC
THERAPY FOR MENTAL HEALTH

by

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A THESIS

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Music therapy (MT) may help address the global epidemics of depression and anxiety. Tailoring of MT interventions to participants' Musical Identity (MI)—an individual's emotional and physical connection to music—may substantially increase the effectiveness of MT. Therefore, we developed and tested an exploratory scale for assessing MI and determined associations between components of MI and sociodemographic and mental health outcomes.

To achieve this goal, we assessed a national sample of 1512 U.S. adults aged 30–70 years in July-August 2023. We measured depression using the validated Patient Health Questionnaire (PHQ-9) and anxiety using the validated Generalized Anxiety Disorder Assessment (GAD-7). A new 12-item MI Inventory (MII) assessed MI. Principal Components Analysis (PCA) using Varimax rotation determined the factor structure of the MII. Cronbach's α assessed internal consistency reliability of each resulting subscale. We examined sociodemographic and mental-health differences across MII components using χ^2 analyses. PCA yielded a strong two-factor solution ($\lambda_1 = 4.9$; $\lambda_2 = 2.4$) with MII subscales focused on musical experience and emotional connection to music.

Higher scores on both subscales were associated with younger age ($p < 0.001$), greater educational attainment ($p < 0.001$), and being employed ($p < 0.001$). Anxiety was significantly associated with both subscales, while depression was significantly associated with only

experience with music performance . Categorizing individuals based on MII profiles may be useful in tailoring MT modalities to optimize mental health outcomes. Younger individuals scoring higher on both subscales highlights the emerging potential for MT's relevance and effectiveness.

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Introduction

Rates of depression and anxiety in the United States (US) have grown steadily over the past two decades. Four in 10 adults have a diagnosed mental health disorder or a friend or family member with one (Lopes et al., 2022). According to the World Health Organization, depression is the leading cause of disability in the world (World Health Organization, 2017). In the US, depression incurs an estimated \$300 billion in direct and indirect costs annually (Greenberg et al., 2021); this figure is greater than the gross domestic product of 130 world nations (Worldometer, 2023).

While pharmacologic treatments for these conditions are useful, they are also costly, can have side effects, and are inconsistently efficacious; about 30% of patients with depression are not helped by the first two medications they try (Levine, 2024). Pharmacological approaches also fail to adequately reach traditionally underserved populations, including people from historically marginalized communities and those with low literacy skills (Ding et al., 2022).

A review of controlled trials found that music therapy is promising as a low-cost, safe, and effective solution—either on its own or as an adjunct to other therapies—for depression (Aalbers et al., 2017). Similarly, a meta-analysis of randomized controlled trials demonstrated the ability of music therapy to reduce anxiety (Lu et al., 2021). Music therapy has been shown to reduce mental health conditions such as these whether it is active or receptive. Researchers found that active therapies, like choir singing and songwriting, as well as receptive therapies, like lyric analysis, reduced depressive symptoms compared to traditional counseling among a sample of Thai adults. Active therapies were found to have caused a greater reduction compared to receptive therapies (Atiwannapat et al., 2016).

Recently, “precision medicine” has been used to tailor treatments to individuals, resulting in improved intervention effectiveness (US Food and Drug Administration, 2018). Similar to a patient benefiting from a particular heart disease medication based on their individual genetic profile, a patient's music therapy treatment could be hypothetically optimized in a similar way based on “musical identity”—factors such as prior experience with and emotional connection to music (Burland et al., 2022; MacDonald & Saarikallio, 2024).

Tailoring pharmacologic therapy to mental health conditions is an active area of research, and many of these approaches have shown benefit (Zanardi et al., 2021). However, tailored approaches may be even more useful in the case of music therapy, because musical identities are highly diverse across populations (Rentfrow & Gosling, 2003).

Pharmacologic approaches to tailoring music therapy ultimately may be available because some prior work has examined the genetic basis of musical calling (Tan et al., 2014). However, this work generally focuses on musical ability—the musical aptitude and skill of an individual—rather than musical identity, and factors related to the latter are more relevant to music therapy. Thus, compared with pharmacologic methods, behavioral and psychometric ones are currently more useful, practical, and feasible.

Conceptually, “musical identity” has been framed using various models. Burland et al. (2022) conducted a factor analysis—a statistical test that measures the shared variance of variables in order to condense them into underlying “factors”—of 86 items assessing 6 areas of musical identity gleaned from preexisting literature and musician insight. This analysis resulted in a model in four components: “Musical calling,” “Musical self-efficacy,” “Emotional attachment,” and “Growth mindset.” Burland et al. 's “Musical Identity Measure” aims to describe an individual's interest and participation in music in order to assess musical motivation

and target areas of growth. MacDonald & Saarikallio (2024) described two major components that focus on “our conceptions of our own musicality” and “the role that music plays in our broader conceptions of ourselves and how we relate to the world” (p. 46). These authors cited Hargreaves’s textbook (2012) as an inspiration for this conceptualization.

Other researchers conceptualized five components of musical engagement: “Cognitive & Emotional Regulation,” “Engaged Production,” “Social Connection,” “Physical Exercise,” and “Dance.” These researchers paired this scale with three “musical indexes” that assessed musical training, instrument playing capabilities, and musical listening frequency (Chin & Rickard, 2012). Other conceptualizations of musical identity focus on preferred musical genres and their features (Rentfrow & Gosling, 2003).

Researchers have also examined associations between musical preference and mental health. For example, among adolescent females, preference for heavy metal music has been associated with increased depression, and preference for soul music has been associated with decreased depression (Miranda & Claes, 2007). While most research operationalizes musical identity in terms of genre, less research has focused on an individual’s listening habits and emotional connection to music informed by unique autobiographical factors.

In addition, while most work in this area involves musical identity and emotion among musicians and professional musicians, it would be useful to examine musical identity in a broader audience to improve relevance to music therapy. While the work of MacDonald & Saarikallio (2024) is relevant to a large audience because it expands the conception of music virtuosity to amateur musicians and non-musicians, this work was primarily theoretical. While Burland et al. (2022) provide strong empirical evidence in developing their “Music Identity Measure,” their work focuses on the more specific population of highly accomplished musicians.

Therefore, the purpose of this study was to assess the factor structure of a new, brief, clinically-relevant measure of musical identity and to determine associations between its components and individual differences in sociodemographics and mental health. Our first research question (RQ1) was: “what is the factor structure of this measure of musical identity and what subscales are represented?” Our second research question (RQ2) was: “which sociodemographic and mental health variables are associated with each of the subscales?” It is hoped that answering these research questions will improve our ability to understand components of musical identity and how they may be useful in the tailoring of music therapy interventions for mental health conditions such as depression and anxiety.

Methods

Participants and Procedures

To collect data, we used an online questionnaire in July and August of 2023 in coordination with Qualtrics Sampling Services (QSS). QSS uses a proprietary algorithm to recruit participants to complete online questionnaires. They use multiple methods of identifying possible participants, including email lists, customer loyalty web portals, and social media presence. As such, owning a computer or smartphone and having internet literacy was required for participation. QSS specifically endeavors to maintain diverse panels that represent the demographics of the United States. In order to mitigate selection bias, invitations to participate were simple, generic, and did not indicate the topic of the questionnaire. All participants were financially compensated. Although the QSS protocol provides a different form of compensation and/or specific amount among individuals, all participants were clearly informed of the amount of compensation before beginning the questionnaire. Completion of the questionnaire required a median of 18.0 [IQR = 13.3, 25.1] minutes. Participants were required to be United States residents ages 30–70 who could read and understand English. No other selection criteria were applied.

To increase data quality, QSS implements a systematic and rigorous protocol. This is particularly important for web-based collection methods. Qualtrics collected responses from 2461 individuals, of whom 418 were deemed unusable for analysis. This included 161 responses for which the participant did not fully consent, 234 responses flagged as too fast for a real person to responsibly consider, and 23 questionnaires that were begun but not completed to at least half of the items. Of the remaining 2043 responses, 531 were subsequently removed for being of poor quality via an additional quality check. For example, 109 were removed for inconsistencies, such

as if an individual stated in one item that they used no social media but later endorsed use of Facebook several times a day. At this stage, an additional 137 were removed for straightlining—answering the same response for every item—and 288 were removed for lack of effort, for example if they entered only nonsensical information in the qualitative portion of the questionnaire. The remaining 1512 individuals used in the final analyses represent a response rate of 61.4%.

The sample was 31% male and 68% female. Only 9 individuals reported sexual identities other than male or female, such as “non-binary” or “transgender.” The mean age of the sample was 49.6 (SD = 11.9). The sample was 77% Caucasian, 13% African American, 3% Asian American or Pacific Islander, and 3% Hispanic/Latin American.

Because of the anonymity provided by Qualtrics and the lack of items assessing high-risk information, this study was certified as exempt by the Institutional Review Board of Oregon State University.

Measures

Musical Identity. Members of the research team designed a Musical Identity Inventory (MII) based on a composite conceptual model adapted from prior work conducted by researchers focused on music and emotion. We emphasized inclusion of work aimed at a general population. Additionally, because of our interest in clinical applications, we preferentially included practical applications of music therapy. Like both Burland et al. (2022) and MacDonald & Saarikallio (2024), we include a component related to musicality, musical skill, and musical knowledge that we call “Experience.” This construct is also related to musical expertise as described by other researchers (Müllensiefen et al., 2014).

We included an “Emotion” component similar to Burland et al. (2022). This component assessed to what extent an individual used music for emotional regulation and modification. This component is of particular relevance to music therapy, because a client’s sense of the connection between music and emotion could help guide specific clinical techniques. While this construct has also been studied by others (Sandstrom & Russo, 2013; Suvi Saarikallio, 2012), their comprehensive measurement instruments are not suited for use in a clinical setting. Thus, we distilled these constructs into a brief set of items.

The two remaining components of the model presented by Burland et al. (2022)—“Musical calling” and “Growth mindset”—were excluded, because they are primarily relevant to professional musicians, while our purpose was to study a broader audience. Finally, we added a third component based on the second component of the model of MacDonald & Saarikallio (2024); they describe it as “the role music plays in our conception of ourselves and the world.” For our model, we labeled this component as “Self.”

Thus, our proposed conceptual model included three components that together present an individual's musical identity: Experience, Self, and Emotion. Each of these three components was represented with four statements for which participants indicated using a slider a number between 0 (“Strongly Disagree”) and 10 (“Strongly Agree”). “Experience” items related to a person’s musical abilities, including items such as “I am confident in my musical abilities.” “Self” items asked participants to what extent they agreed with statements such as “Music is important to my identity” and “Music is an important part of my social life.” Finally, items used to assess “Emotion” included statements such as “Music can help pull me out of a bad mood” and “Music can help energize me.”

Sociodemographic Data. Sociodemographic factors were self-reported during the questionnaire. Gender identity was assessed using multiple categories (e.g., “female,” “male,” “non-binary,” and “transgender”) as well as an opportunity to write-in a different identity descriptor. Race, ethnicity, educational experience, employment status, and marital status were assessed using items with categories listed in Table 2.

Depression and Anxiety Screening. Because of our ultimate goal of leveraging music therapy to improve mood disorders, we assessed participant depression and anxiety using valid, reliable scales. Depression was assessed using the 9-item Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001), which asks participants to indicate how often they have recently experienced a particular symptom. In particular, the question reads “Over the past 2 weeks, how often have you been bothered by any of the following?” This is followed by a list of statements for which response categories were “Not at all (0),” “More than half the days (1),” “Several days (2),” and “Nearly every day (3).” Example statements include “Feeling down, depressed, or hopeless” and “Having little interest or pleasure in doing things.” Because there are 9 items, each of which yields a response ranging from 0 to 3, the resulting composite scale ranges from 0 to 27. We used the established and validated cutoff for depression of 11 or greater on this scale (Kroenke et al., 2001). Anxiety was assessed using the 7-item Generalized Anxiety Disorder Assessment (GAD-7) (Plummer et al., 2016). The question stem of this assessment reads “Over the last 2 weeks, how often have you been bothered by the following problems?” Following is a list of statements for which response categories were “Not at all (0),” “More than half the days (1),” “Several days (2),” and “Nearly every day (3).” Example statements include “Feeling nervous, anxious or on edge” and “Worrying too much about different things.” The 7 items, each

with a score of 0 to 3, resulted in a scale ranging from 0 to 21. We used the established and validated cutoff for anxiety of 10 or greater on this scale (Plummer et al., 2016).

Analyses

Our analytic protocol related to scale assessment consisted of four components. First, we performed exploratory Principal Components Analysis (PCA) with Varimax rotation using the 12-item music identity scale forcing 3 factors—the number suggested by the conceptual model. We selected PCA because our goal was to simplify the data by transforming multiple items into a few summary scores. Second, we used findings from that initial PCA and a scree plot of its associated eigenvalues to determine the optimal number of factors suggested by the data, whether or not this matched our a priori model. Third, we conducted additional PCA tests forcing different numbers of factors suggested by the previous step. Finally, we conducted a final PCA after removal of any items with ambiguous factor loadings, but only if retrospective interpretation of item wording indicated problematic item validity or reliability.

We defined a factor loading of ≥ 0.3 as sufficient to warrant inclusion in our final model (Finch, 2019). If an item loaded sufficiently on more than one factor, it triggered a review of the item for ambiguity and possible removal. After the PCA analyses, we assessed the internal consistency reliability within individual subscales using Cronbach's α (Cronbach, 1951).

We then examined sociodemographic differences across the Musical Identity scale components using χ^2 analyses. For these analyses, our protocol operationalized the dependent variables—scores associated with each of the retained components of the MII scale—in tertiles (low scoring, medium scoring, and high scoring). We operationalized MII subscales into tertiles for these analyses to improve interpretability and clinical utility of results. Independent variables

(sociodemographic and mental-health related variables) were operationalized in categories based on established protocols, real-world significance, and ensuring sufficiently large cell sizes to maintain stability of statistical models.

Statistical analyses were performed with Stata 18.0 (Stata Corp, College Station, Texas), and significance was defined using two-tailed α of 0.05 for all analyses.

Results

To assess the factor structure of items, we first conducted a PCA using Varimax rotation forcing three factors linked to our hypothesized three-component conceptual model. This yielded two strong factors: one with an eigenvalue of 4.45 that explained 64% of the variance, and a second with an eigenvalue of 2.30 that explained 33% of the variance (Table 1, Analysis 1). The third factor had an eigenvalue of 0.83, a substantial drop from the first two. Visual examination of the scree plot also indicated a two-factor solution (Figure 1). Finally, no items loaded primarily on factor 3 (Table 1, Analysis 1), further validating a two-factor solution.

Therefore, we conducted a second PCA forcing two factors. This analysis yielded factors with eigenvalues of 4.9 and 2.4 (Table 1, Analysis 2). Items 2, 3, 5, 6, 8, 9, 10, and 11 loaded on factor 1, and items 1, 4, 7, and 12 loaded on factor 2. The items loading on factor 1 were precisely the same items that were hypothesized to correspond to “Self” or “Emotion” components. The items loading on factor 2 were those hypothesized to be in the “Experience” component.

Analysis 2 in Table 1 demonstrates that items 2, 4, and 5 were flagged as “ambiguous” according to our criteria because they loaded ≥ 0.3 on both factors. Additional examination of these items suggested that the items were in fact ambiguous in wording or possible interpretation. For example, item 4 asked participants to what extent they agreed with the statement, “I enjoy playing music.” In retrospect, what is meant by “playing music” is unclear. While we intended this to refer to music creation (e.g., playing of an instrument, singing), it may have been interpreted as “playing” favorite recorded music on a device such as a cell phone or computer. The other two questionable items were also removed from the next PCA because they were found to have possible ambiguity of meaning. Therefore, we conducted a final PCA with

the remaining 9 items, again forcing a two-factor solution (Table 1, Analysis 3). As it was with analysis 2, items loading on factor 1 were all associated with the items hypothesized to correspond to “Self” or “Emotion” while items loading on factor 2 were those hypothesized to correspond to “Experience.”

Subscale 1 included items 3, 6, 8, 9, 10, and 11. The wording of these items can be found in Table 1. This scale included items from both the “Self” and “Emotion” hypothesized components; therefore, we labeled this combined component “Self and Emotion.” Scale 2 included items 1, 7, and 12, which read, “I am confident in my musical abilities,” “I can write my own music,” and “I play musical instruments.” These items were hypothesized to assess the “Experience” component of our conceptual model. Because no additional items loaded onto this factor, this component stayed in our final conceptual model. Therefore, with regard to RQ1, we found a two-factor model with subscales focused on “Self and Emotion” and “Experience.”

The 6-item “Self and Emotion” subscale based on factor 1 had excellent internal consistency, with a Cronbach’s α of 0.92. Similarly, the 3-item “Experience” subscale was internally consistent with a Cronbach’s α of 0.85.

With regard to the psychiatric outcomes, using recognized cutoffs for the PHQ-9 and the GAD-7, 464 individuals (31%) screened positive for depression and 399 (26%) screened positive for anxiety. The breakdown of the sociodemographic items can be found in Table 2.

Sociodemographic differences across the two components “Self and Emotion” and “Experience” are presented in Table 2, which addresses RQ2. These analyses found that scoring high on the “Self and Emotion” scale was associated with younger age, higher educational attainment, and being employed. Compared with individuals without anxiety, those with anxiety scored higher on this scale.

Higher scores on the “Experience” scale were associated with male sex, younger age, being non-white, higher educational attainment, being employed, and being married. We also found that both depression and anxiety were associated with higher scores for this subscale.

Discussion

Our national study of 1512 US adults had three major findings. First, while we originally hypothesized a conceptual model of musical identity consisting of three components, the PCA suggested that the hypothesized components “Self” and “Emotion” should be combined, resulting in a two-component model: “Experience” and “Self and Emotion.” Second, bivariate analyses demonstrated multiple associations between responses on the MII subscales and sociodemographic variables (Table 2). Of particular interest, compared to older individuals, younger individuals had greater likelihood of scoring high on both subscales. Third, scoring high on the “Experience” subscale was associated with higher rates of depression and anxiety and scoring high on the “Self and Emotion” subscale was associated with higher rates of anxiety (Table 2).

The constructs “Self” and “Emotion” loaded on the same factor in the PCAs, suggesting that these ideas are strongly related. “Experience,” however, comprised an independent factor. This has implications for music therapy: while leveraging a client’s musicianship can be valuable, simply having experience with playing music does not necessarily translate into a greater emotional connection to music. Instead, the fact that “Self” and “Emotion” loaded on the same factor may suggest that the emotional connection one feels to music relates to their sense of “musical self,” over their level of perceived musicianship. This is consistent with prior findings that musical identity and emotional regulation are closely linked (Chong et al., 2024). It will be interesting to determine whether these constructs are linked in other samples, such as individuals younger than 30. Depending on their specific research questions, future researchers may prefer to keep “Self” and “Emotion” as separate constructs or to combine them as we did.

Alongside traditional music therapy assessments, scores on each of the two MII subscales could be used to tailor individuals to optimal music therapy treatments for mental health (Figure 2). For example, individuals who score high on both subscales might be ideally matched to songwriting interventions, such as therapeutic songwriting, which enable therapists to help clients process their emotions through writing their own songs. These types of interventions may leverage both the patient's experience with music and their emotional connection to music (Baker et al., 2008; Baker, 2015; Gee et al., 2019).

For people who score high on the "Self and Emotion" subscale but low on the "Experience" subscale, receptive music therapies might be more effective (Figure 2). Compared with active music therapy, receptive music therapy is less demanding: It focuses on processing emotions after listening to and/or discussing a piece of music or song (Gardstrom & Hiller, 2010; Grocke & Wigram, 2006). These individuals have the desire and/or aptitude to discuss personal and emotional elements of music, but they may find the actual experience of composing to be daunting.

Individuals scoring high on "Experience" but low on "Self and Emotion" may benefit from "re-creative" techniques, which involve performance and instrumental engagement as primary drivers of the therapeutic experience (McHugh et al., 2012). These styles emphasize the power of direct musical engagement with the client. Research suggests this intervention style is enhanced when there is a live educational component (Silverman, 2014). Some studies have demonstrated that therapeutic based music education and improvisation can improve emotional regulation and decrease depressive symptoms (Aalbers et al., 2019).

Finally, for individuals scoring low on both subscales, interventions emphasizing passive use of music to assist with relaxation and related outcomes might be particularly useful. For

example, researchers have used this intervention type in hospital settings to assist patients before and after procedures (Madson & Silverman, 2010), after cardiac surgery (Dong et al., 2023), and in palliative care (Gutgsell et al., 2013; Warth et al., 2015).

It is important to note that Figure 2 represents a broad initial framework that can be honed through future work. It is meant as a starting point and is not meant to capture the complexity of music therapy modalities and/or mental health treatment. It is also important to emphasize that not all music therapy treatments will benefit from tailoring. For example, specific modalities have been developed to assist individuals relearning how to walk after stroke (Kang et al., 2016). Idiosyncratic therapies such as this may not benefit from tailoring based on musical identity.

In addition, tailoring using information from the MII is only one part of a complex treatment plan that must include factors related to both the client and the therapist. It is useful to consider what modalities would be most pragmatic for a client or therapist regardless of the client's subscale placements. Specific client symptoms, goals, and desires should be taken into account. Additionally, contextual factors about the modality and therapist's practices should be considered. For example, some modalities of music therapy, such as therapeutic songwriting, are primarily conducted in group settings which may not be conducive to individual tailoring. Thus, while subscale placement could be valuable, it is only one consideration when constructing a multimodal treatment plan tailored to a client. Music therapy is one of many therapeutic tools that can help combat complex mental illnesses like depression and anxiety.

We found that scores on both subscales were associated with certain sociodemographic characteristics (Table 2). Of particular note, scoring high on either scale was associated with being younger. For example, 38% of people aged 30-39 scored "high" on the Self and Emotion

subscale, while only 22% of people aged 60-70 did. Similarly, 54% of people aged 30-39 scored “high” on the Experience subscale, while only 16% of people aged 60-70 did. This could be due to sociocultural factors. In the US, younger people tend to engage in more musical experiences as they explore their identities and participate in activities tailored to unmarried individuals. As these people age, have children, and develop their careers, however, they may reduce time and energy spent with outlets such as music. This finding may also indicate a generational effect idiosyncratic to the current day; perhaps innovations such as music streaming services and digital audio workstations are making musical engagement and creation more accessible. If so, this underscores the potential of music therapy as a promising way to respond to the population’s growing emotional connection to music.

Scoring high on both the “Experience” and the “Self and Emotion” subscales was associated with higher rates of anxiety, and higher scores on “Experience” were associated with depression. This does not suggest a causal relationship between musical identity and mental health. However, it may be useful for music therapists treating individuals with mental health disorders to consider reasons for these associations.

For results related to the “Experience” subscale, it is possible that people who play music are more driven to succeed at difficult tasks. This drive might manifest in feelings of inadequacy that could exacerbate depressive tendencies. Musicians might also feel increased anxiety and stress related to musical performance.

With regard to the “Self and Emotion” subscale, it is possible that individuals predisposed to depression and anxiety may use music to “self-medicate.” These individuals may also feel a desire to amplify their emotional states, positive or negative, by exposing themselves to emotional music (North, 2010). However, it is also possible that experiencing emotional music

makes people respond to situations more emotionally. Future qualitative investigations may help elucidate the possibilities for the association between scale scores and mental health variables. Regardless of the precise reasons for the associations between scale scores and emotional variables, these findings support the potential efficacy of music therapy, especially among people who score high on one or both subscales.

While our findings suggest benefits for tailoring music therapy, further research related to this specific question would be valuable. Future research could examine factor structure, reliability, and validity in other contexts. In addition, it may be useful for future studies to investigate empirically if tailoring to an individual's "Musical Identity" increases efficacy of treatment. Such an empiric examination may involve a prospective trial in which some participants receive a standardized music therapy intervention while others receive tailored interventions based on their responses to the MII. Qualitative research could also explore whether tailored interventions are feasible and acceptable to participants.

Limitations

Although our sample was large and national, it was skewed in terms of gender and race; it would be useful for future research to involve larger populations of males and those with minority status. In addition, a large percentage of our sample had unusable data. Our Musical Identity instrument was designed to be brief, both to lower respondent burden and to enable researchers and practitioners to include them easily in larger assessments. However, this choice of a brief scale involves a tradeoff: there are fewer items by which to describe these complex constructs. It may be useful for future research to include larger bodies of items that could be used for different purposes for measuring Musical Identity. Our findings were also limited in

that, while our mental health outcomes (depression and anxiety) were assessed using validated scales, the gold standard for determination of depression and/or anxiety necessitates an interview with a trained clinician. Because this was not feasible given the design of our study, this was a necessary limitation. Finally, it should be noted that, because our sample was general population-based, inferences to clinical populations should be made with caution.

Conclusion

Music therapy may help address the current global mental health epidemic. Given the wide range of musical preferences and experiences among individuals, tailoring therapy to an individual's Musical Identity could increase efficacy of treatment. In our population, we identified two distinct subscales—"Experience" and "Self and Emotion"—as key elements of Musical Identity. Furthermore, participants with mental health conditions tend to have a stronger emotional connection to music, which suggests particular benefits of music therapy treatment in this population.

Figures

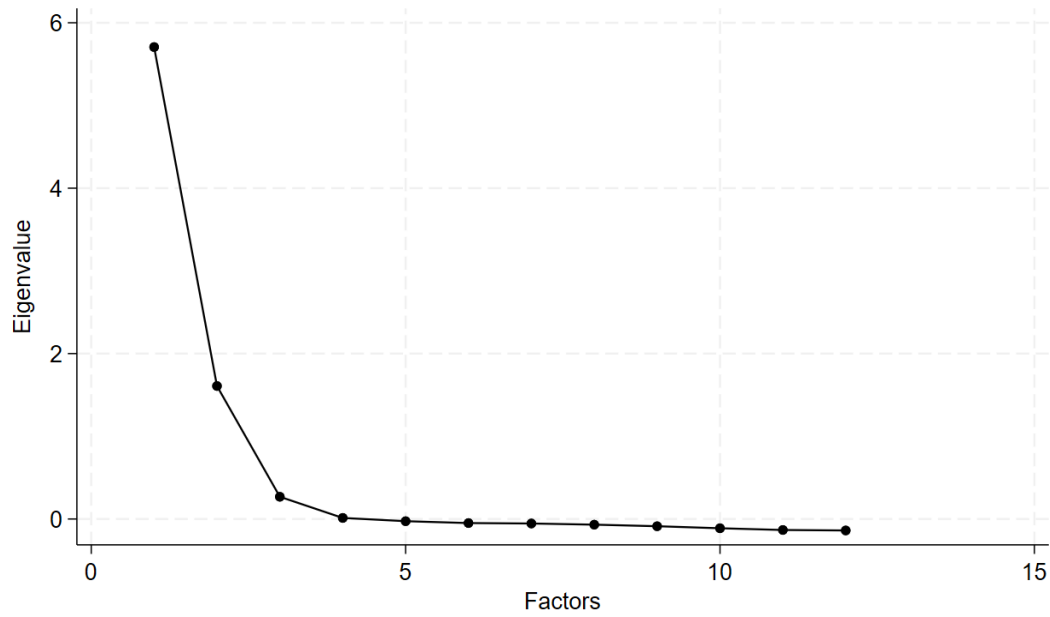


Figure 1: Scree plot of the initial Principal Components Analysis

This figure depicts the scree plot that resulted from the initial Principal Components Analysis.

This pattern suggests a two-factor solution.

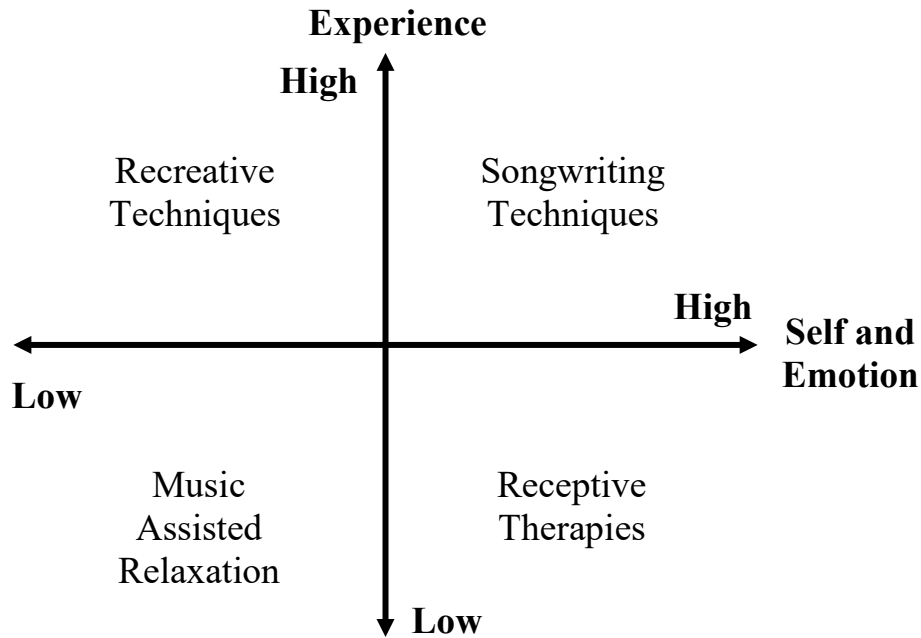


Figure 2: Chart of possible tailoring of music therapy modalities based on Musical Identity Inventory (MII) scores

This graphic approximates how music therapy might be tailored to individual clients based on subscores of the Music Identity Inventory. Along the x-axis we represent an individual's score on the “Self and Emotion” subscale. Along the y-axis we represent an individual's score on the “Experience” subscale. Specific intervention types and rationales for each are discussed in the manuscript. These are meant as suggestions to help guide treatment.

Tables

Item #	Item	Hypothesized Scale	Analysis 1 ^a			Analysis 2 ^b		Analysis 3 ^c	
			Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 1	Factor 2
1	I am confident in my musical abilities	Experience	0.19	0.76 ^d	0.14	0.21	0.77	0.22	0.76
2	Music is important to my identity	Self	0.56	0.28	0.52	0.67	0.35	–	–
3	Music can help pull me out of a bad mood	Emotion	0.81	0.05	0.05	0.80	0.03	0.81	0.04
4	I enjoy playing music	Experience	0.34	0.48	0.12	0.35	0.48	–	–
5	Music is an important part of my social life	Self	0.54	0.34	0.49	0.65	0.40	–	–
6	Music can help energize me	Emotion	0.83	0.11	0.07	0.82	0.09	0.83	0.10
7	I can write my own music	Experience	0.09	0.75	0.12	0.11	0.75	0.11	0.75
8	I'm passionate about my favorite music	Self	0.72	0.18	0.29	0.77	0.20	0.76	0.19
9	Music helps me stay emotionally stable	Emotion	0.73	0.21	0.29	0.77	0.23	0.76	0.23
10	I feel connected to music	Self	0.77	0.20	0.30	0.82	0.22	0.80	0.22
11	Music can be emotionally therapeutic for me	Emotion	0.83	0.08	0.06	0.81	0.06	0.83	0.07
12	I play musical instruments	Experience	0.08	0.78	0.07	0.09	0.77	0.09	0.78

^a Analysis 1 forced 3 factors because 3 subscales were hypothesized.

^b Based on the scree plot and factor loadings from analysis 1, both of which suggested a 2-factor solution, analysis 2 forced 2 factors.

^c Analysis 3 represents the final scale items after removing items loading on both factors at ≥ 0.3 . Items 2, 4, and 5 were removed due to ambiguity. The 6 items loading on factor 1 comprise the “self and emotion scale” and the 3 items loading on factor 2 comprise the “experience scale.”

^d Bold number indicate factor loadings ≥ 0.45 , which was considered a strong loading.

Table 1: Factor loadings for the Musical Identity Inventory (MII) items

Variable	Experience			Self and Emotion			p for χ^2	Total
	Low	Medium	High	Low	Medium	High		
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)		
Sex ^a							0.12	
Male	110 (23)	126 (27)	237 (50)	149 (32)	164 (35)	160 (34)		473
Female	423 (41)	385 (37)	222 (22)	380 (37)	321 (31)	329 (32)		1030
Age							< 0.001	
30-39	69 (18)	105 (28)	202 (54)	94 (25)	138 (37)	144 (38)		376
40-49	116 (31)	132 (35)	130 (34)	111 (29)	136 (36)	131 (35)		378
50-59	162 (43)	151 (40)	68 (18)	140 (37)	106 (28)	135 (35)		381
60-70	190 (50)	125 (33)	62 (16)	187 (50)	107 (28)	83 (22)		377
Race							0.09	
White	453 (39)	377 (33)	330 (28)	420 (36)	383 (33)	357 (31)		1160
Black	40 (20)	77 (39)	79 (40)	65 (33)	56 (29)	75 (38)		196
Other ^b	44 (28)	59 (38)	53 (34)	47 (30)	48 (31)	61 (39)		156
Education							< 0.001	
No Degree	410 (40)	367 (36)	248 (24)	383 (37)	304 (30)	338 (33)		1025
Associate's or Bachelor's Degree	91 (31)	100 (34)	102 (35)	111 (38)	97 (33)	85 (29)		293
Master's or Doctorate Degree	36 (19)	46 (24)	112 (58)	38 (20)	86 (44)	70 (36)		194
Employment							< 0.001	
Employed	270 (29)	301 (32)	361 (39)	273 (29)	325 (35)	334 (36)		932
Partially Employed ^c	226 (48)	172 (36)	74 (16)	221 (47)	129 (27)	122 (26)		472
Unemployed	41 (38)	40 (37)	27 (25)	38 (35)	33 (31)	37 (34)		108
Marital Status							0.27	
Single	118 (32)	134 (37)	115 (31)	123 (34)	125 (34)	119 (32)		367
Married	255 (33)	244 (31)	284 (36)	265 (34)	259 (33)	259 (33)		783
Other ^d	164 (45)	135 (37)	63 (17)	144 (40)	103 (28)	115 (32)		362
Depression ^e							0.01	

No	394 (38)	356 (34)	298 (28)	383 (37)	335 (32)	330 (31)	1048
Yes	143 (31)	157 (34)	164 (35)	149 (32)	152 (33)	163 (35)	464
Anxiety ^f							< 0.001
No	413 (37)	382 (34)	318 (29)	415 (37)	371 (33)	327 (29)	1113
Yes	124 (31)	131 (33)	144 (36)	117 (29)	116 (29)	166 (42)	399

^a Nine individuals (<1%) indicated a sex other than male or female (e.g., non-binary or transgender).

^b Includes Latinx, Native Hawaiian, Alaskan Native, Native American, Asian, or Pacific Islander.

^c Includes part-time work.

^d Includes divorced, separated, or widowed.

^e As defined by the Patient Health Questionnaire (PHQ-9), using the standard cutoff of 11.

^f As defined by the Generalized Anxiety Disorder Assessment (GAD-7), using the standard cutoff of 10.

^g Bold items indicate a p-value of ≤ 0.05 .

Table 2: Associations between Musical Identity Inventory (MII) subscale placement, sociodemographic variables, depression, and anxiety

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