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Emotional and well-being responses to binaural beat music: a mixed-methods exploratory study of cultural background and music preference

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Binaural beats (BB), an auditory illusion triggered by frequency differences in sound, have been increasingly explored in relation to emotional responses and well-being. However, less is known about how listeners from different cultural and musical backgrounds emotionally engage with and interpret BB listening experiences. This exploratory mixed-methods study examined the emotional and well-being responses of 19 participants (British $n = 9$; Chinese $n = 10$) to music embedded with BB during a one-week listening period. A mixed-methods approach combined pre- and post-listening well-being measures with qualitative diary reflections and interviews that explored listening experiences. Both groups demonstrated a significant main effect of time, with scores indicating an increase in subjective well-being. However, qualitative findings revealed substantial variation in the musical style that was chosen by participants as well as how they emotionally engaged with and interpreted the BB listening environment. Participants who were more familiar with ambient, instrumental, or minimally structured forms of music listening described the experience as emotionally accessible, calming, or immersive. By contrast, participants whose listening expectations centered around more recognizable melodic or lyrical musical structures described emotional distance or difficulty connecting with the listening experience. The findings suggest that emotional engagement with BB music may be shaped not only by the sonic qualities of the music but also by listeners' prior listening experiences, familiarity, and musical expectations, and the expressive meanings they associate with the listening experience.

KEYWORDS

binaural beats, cultural differences, emotional response, music preference, well-being

Introduction

Music listening, well-being, and emotional responses

Music listening has been widely associated with psychological well-being (Cook et al., 2019; Juslin and Västfjäll, 2008; Schäfer et al., 2020). In this context, well-being is conceptualized as individuals' subjective experience of positive emotional states, life satisfaction, and psychological functioning (Diener and Suh, 1997; Ryan and Deci,

2001). Because emotional responses to music are highly personal, researchers have increasingly sought to understand the factors that shape how music influences well-being. Emotional engagement with music is also shaped by listeners' previous experiences, familiarity, and listening context, which influence how music is interpreted and experienced emotionally (Juslin and Laukka, 2004; Saarikallio et al., 2021). These factors may include cultural background and individual listening preferences, both of which influence how listeners interpret and experience musical emotions (Boer and Fischer, 2012; Schäfer et al., 2013). These individual differences may lead to cross-cultural differences in music-related emotional responses, which remain relatively underexplored (Morrison and Demorest, 2009; Wang et al., 2021). Beyond its everyday role in emotional responses, music listening has increasingly been explored as a simple and accessible intervention for supporting emotional responses and psychological well-being. Previous research has shown that music-based interventions can reduce stress, improve mood, and facilitate relaxation in both clinical and everyday contexts (Adiasto et al., 2022; Harney et al., 2023; Hillebrand et al., 2023; North et al., 2004; Thoma et al., 2012; Vigl et al., 2023). Within this broader field of music listening interventions, researchers have begun to investigate specific auditory techniques designed to enhance these effects. One such technique is the use of binaural beat music.

Binaural beats and their potential for effect on emotional response and well-being

Binaural beats (BB)—a perceptual auditory phenomenon occurring when two slightly different frequencies are presented separately to each ear—have garnered increasing attention for their potential to modulate brainwave activity and induce states of relaxation, focus, and emotional balance (Garcia-Argibay et al., 2019). The BB illusion is believed to influence brain activity through neural synchronization, whereby brain oscillations align with the frequency of the auditory stimulus (Ingendoh et al., 2023). Electroencephalogram (EEG) studies have demonstrated that BB exposure can alter cortical neural oscillations, modulating their frequency and synchrony (Garcia-Argibay et al., 2019). This modulation is particularly significant, as specific brainwave frequencies have been linked to distinct emotional and cognitive states. For example, alpha waves (8–12 Hz) are associated with anxiety reduction (Chaieb et al., 2015), while theta waves (4–8 Hz) have been found to enhance relaxation and emotional stability (Lee et al., 2019). These findings suggest that BB may be associated with changes in emotional and well-being states through neural oscillatory activity.

As well as outcomes, research studies have provided several important considerations for designing BB research. The first is exposure time. Ala et al. (2018) demonstrated that only nine minutes of BB stimulation could alter connectivity between cortical regions, highlighting the timeline of the potential to enhance cognitive processing and emotional responses. Similarly, Jirakittayakorn and Wongsawat (2017) observed that after just ten minutes of exposure to 6 Hz BB, neural oscillations became detectable across all cortical areas, providing evidence that BB can facilitate widespread cortical synchronization within 10 min.

Another design-related consideration is scope, since existing research is largely based on single-session laboratory studies and predominantly involves Western listeners (Ala et al., 2018; López-Caballero and Escera, 2017; Shakya et al., 2026). This limits the generalizability and ecological validity of findings. It leaves the longer-term effects of BB music use relatively underexplored, with only a limited number of studies addressing longer-term outcomes (Battu et al., 2025; Chockboondee et al., 2024). Furthermore, neuroscientific research has suggested that auditory processing and emotional responses to music can be significantly influenced by cultural background (Pang et al., 2024), implying that BB's impact might be subject to cultural variations, especially when they are embedded in music.

Finally, studies that have reported outcomes related to well-being, such as stress reduction (Lee et al., 2022; Platt and Hammond, 2025), sleep improvement (Dabiri et al., 2022; Lin et al., 2024), and therapeutic interventions (Thummapol et al., 2025), are often primarily situated within clinical or task-specific contexts. Consequently, broader experiences of BB music in relation to general well-being remain insufficiently understood. This is important to study as BB music offers practical advantages as a tool for supporting emotional responses and well-being: it is a low-threshold, cost-effective, and easily accessible intervention. Taken together, a logical next step is to study how well BB music listening for a minimum of 10 min a day can be easily integrated into everyday life, without requiring specialized equipment or clinical supervision, and the emotional response and well-being outcomes of such an approach for people who come from different cultural backgrounds.

Cross-cultural differences in emotional responses to music

Research in music psychology suggests that aspects of emotional responses to music may be universally recognized across cultures. It has been established that listeners can reliably identify basic emotions in unfamiliar musical traditions. For example, Western listeners are able to recognize emotions in Indian music despite having no prior exposure (Balkwill and Thompson, 1999). Similarly, a high level of agreement has been observed between Western and East Asian listeners in perceiving emotions such as happiness, sadness, and anger in music (Cowen et al., 2020; Fang et al., 2017). These findings suggest that some emotional cues in music may be processed in similar ways regardless of cultural background.

However, alongside these universal tendencies, cultural background remains an important source of variation in emotional responses to music. Listeners from different cultural backgrounds may interpret and respond to the same musical stimuli in distinct ways, influencing both the perception and experience of musical emotions (Balkwill and Thompson, 1999; Cowen et al., 2020; Li et al., 2025; Saarikallio et al., 2021; Wang et al., 2021). Cultural familiarity plays a key role in shaping emotional engagement, with non-Western listeners often evaluating the emotional effectiveness of Western music differently from Western listeners (Egermann et al., 2015; Morrison and Demorest, 2009). Music that aligns with culturally familiar melodic, rhythmic, and harmonic structures tends to

evoke stronger resonance (Curtis and Bharucha, 2010; Wang et al., 2021). In addition, culturally familiar music is more likely to trigger autobiographical memories, which can enhance emotional responses and well-being (Janata et al., 2002).

While many cross-cultural studies have focused on how listeners perceive emotional cues in music, less attention has been paid to how cultural background may shape listeners' emotional responses in music listening interventions (Morrison and Demorest, 2009; Wang et al., 2021).

Role of music preference and cultural background in shaping emotional responses

Individual music preference plays a central role in shaping emotional responses to music. Rather than being determined solely by acoustic features, emotional experiences in music listening are mediated by underlying psychological mechanisms (Juslin and Västfjäll, 2008). Among these, preference and enjoyment are particularly important, as listeners tend to experience stronger emotional engagement and greater well-being benefits when listening to music they like (Chin and Rickard, 2014; Juslin and Laukka, 2004). Conversely, exposure to unpreferred music may result in weaker or even negative emotional responses (Merrill et al., 2023). In addition, familiarity with a musical style enhances emotional resonance, as repeated exposure increases both cognitive fluency and affective connection, a phenomenon commonly explained by the mere exposure effect (Fink et al., 2021; Zajonc, 1968). Music preference is also context-dependent, with listeners selecting music to meet specific emotional or situational needs, such as relaxation, concentration, or mood regulation (Thoma et al., 2012; Van den Tol and Edwards, 2013).

Importantly, music preferences are not formed in isolation but are shaped by cultural background. Cultural values and listening environments influence the types of music individuals are exposed to, as well as the meanings they attribute to musical experiences. For example, listeners in individualistic cultures (e.g., Western societies) often use music for self-expression, whereas listeners in collectivistic cultures (e.g., East Asia) may engage with music in ways that support social harmony and emotion regulation within a group context (Boer and Abubakar, 2014; Boer and Fischer, 2012; Saarikallio et al., 2021). These culturally shaped listening habits contribute to differences in music preference across cultural groups.

Taken together, these findings suggest that musical preference should also be considered when examining cross-cultural differences in emotional responses to music.

The present study

Given the limited research examining how listeners from different cultural backgrounds experience BB music in everyday listening contexts, the present study adopted an exploratory mixed-methods approach to investigate listeners' emotional responses and perceived well-being associated with listening regularly to BB music over a period of time. Instead of testing specific causal hypotheses,

the study seeks to provide preliminary, hypothesis-generating insights into how listeners from different cultural backgrounds engaged with and interpreted BB music within everyday listening contexts, and how familiarity, music preference, and previous listening experiences may shape emotional engagement with this form of music listening.

Specifically, this study examined: (1) how participants from different cultural backgrounds responded to BB music in terms of subjective well-being, (2) how they described their emotional responses to BB music, (3) how music preference may shape these responses, and (4) how participants perceived the potential usefulness of BB music for emotional support and everyday well-being.

Methodology

Participants

A total of 21 university students from the United Kingdom (UK) and China were recruited through university networks and social media, with 19 completing the full study (9 UK, 10 Chinese). All participants were undergraduate or postgraduate students from the same University in the UK and were residing in the UK at the time of the study. Cultural grouping was based on self-identified cultural background. Chinese participants were international students who had lived in the UK for between six months and one year before participation. The British group included 2 males and 7 females ($M_{age} = 27$, $SD = 6.77$), while the Chinese group comprised 2 males and 8 females ($M_{age} = 28$, $SD = 6.40$). Participants reported regular music listening habits (defined as listening to music multiple times per week) and baseline well-being scores. Mean baseline scores were 14.89 ($SD = 6.45$) for British participants and 14.00 ($SD = 3.37$) for Chinese participants. University students were selected because prior research indicates that this population frequently uses music for emotional regulation and stress relief (Finnerty et al., 2021; Krause et al., 2015; Krause et al., 2021a; Vidas et al., 2021). Ethical approval was granted by the authors' institutional ethics committee, and all participants provided written informed consent.

Design and procedure

This study employed a mixed-methods design, integrating quantitative surveys and qualitative diary studies over a one-week intervention. Participants first completed a pre-questionnaire assessing demographic information, music listening habits, and baseline well-being. They then received an email containing instructions for downloading the Audicin application, a free redemption method, and a short video created by the first author explaining the application and how to use it during the study. During the intervention, participants listened to BB music via the Audicin app for at least 10 min per day using headphones. Listening was scheduled according to participants' preferred time within an evening window between 7:00 PM and 11:00 PM. Music selection was left to participants, who could choose individual tracks or playlists designed for well-being purposes, known as Journeys (e.g., Work with the Flow, Relieve Anxiety). Participants were advised not to use playlists intended for use during sleep, to

prevent accidental over-listening if they fell asleep. Listening location and side activities were not otherwise restricted. Emotional responses were recorded in structured diary entries within the same evening time frame. After the intervention, participants completed a post-questionnaire assessing their well-being and participated in semi-structured interviews exploring their experiences with the auditory intervention as an emotional support tool.

Materials and measures

Firstly, musical stimuli were provided by Audicin, an application featuring BB-based, lyric-free auditory interventions. The musical stimuli consisted of electronic instrumental ambient music and soundscapes (e.g., nature sounds such as rainfall and birdsong) embedded with BB and rendered in 360-degree sound engineering, without any culturally specific musical features. While participants selected from a predefined set of BB tracks rather than freely choosing music, the Audicin library contained approximately 14 h and 48 min of music, providing a broad range of options, given that participants were required to select only 10 min per day. Participants reported their music preference using a single-item five-point Likert scale, ranging from 1 (strongly dislike) to 5 (strongly like). Baseline stress-related exhaustion, used here as an indicator of well-being, was measured using the Karolinska Exhaustion Disorder Scale (KEDS; Besèr et al., 2014), a validated nine-item questionnaire. Moreover, to capture subjective emotional responses and perceived usefulness, open-ended questions were included in diary entries and post-questionnaires.

For analytical purposes, the emotional characteristics of the musical tracks were derived from Zetners et al.'s (2008) nine-factor model of emotional responses to music. These nine emotional descriptors were consolidated by the researchers into three broader categories of emotional responses: (1) Positive and Uplifting Emotions, (2) Calm and Soothing Emotions, and (3) Emotionally Intense (see Table 1). This grouping reflects broader experiential listening modes, capturing emotions associated with positive activation, relaxation-related experiences, and emotionally powerful responses. Although emotions such as sadness are typically classified as low arousal in models such as Russell's circumplex model (1980), in the present study, they were grouped within the "emotionally intense" category to reflect the subjective strength and depth of emotional engagement reported by participants during music listening. In the quantitative analysis, cultural background and music preference were treated as independent variables, while well-being scores were analyzed as dependent variables.

Semi-structured interviews were conducted to further explore participants' experiences of using BB music during the intervention. The interview questions were designed to explore participants' subjective experiences of the intervention and to complement the quantitative measures used in the study. Specifically, the questions aimed to capture emotional responses, perceived changes in well-being, and user perceptions of the technology, which are aspects that may not be fully reflected in physiological or survey-based outcomes. A semi-structured format was chosen to allow participants to describe their experiences in their own words while ensuring that key topics relevant to the study objectives were consistently addressed across interviews. This

TABLE 1 Emotional categories used to classify participants' reported responses to binaural beat music.

Positive and uplifting	Calm and soothing	Emotionally intense
Moving	Mellow	Energetic
Inspiring	Sentimental	Intense
Happy	Relaxing	Sad

approach is commonly used in exploratory research examining user experiences with emerging health and well-being technologies. Example questions included: "How did listening to the Audicin music affect your emotional state?" "Did you notice any changes in your well-being during the week?", and "Would you consider continuing to use this type of music in the future?"

Data analysis

All quantitative analyses were conducted using SPSS. Descriptive statistics were used to summarise participants' well-being scores, music preference ratings, and reported emotional responses across the listening period. Paired-samples t-tests were conducted to explore changes in KEDS scores before and after the listening period within each group. Exploratory correlation analyses were also used to examine possible associations between music preference and self-reported emotional and well-being experiences. Because diary entries represented repeated observations nested within participants, entry-level findings were treated as exploratory and descriptive rather than statistically independent participant-level observations.

Thematic analysis (Braun and Clarke, 2006) was used to analyze the qualitative data from diary entries, questionnaires, and interviews. The analysis followed Braun and Clarke's six-step framework, including familiarization with the data, generating initial codes, searching for themes, reviewing and defining themes, and producing the final report. All interview recordings were transcribed and anonymized, and the data were read multiple times to ensure familiarity. Coding was conducted by the first author using NVivo software to organize and manage the qualitative data. Initial codes were generated and iteratively refined and subsequently grouped into broader themes reflecting participants' emotional responses to BB music. To enhance credibility, triangulation was applied by integrating questionnaire responses, diary reports, and interview data. A reflexive approach was adopted throughout the analytic process, acknowledging the researcher's interpretive role in theme development. In line with a reflexive thematic analysis approach, the analysis focused on developing a coherent and transparent interpretation of patterns across the dataset.

Results and findings

Quantitative results

Descriptive statistics for the main study variables are presented in Table 2. Overall, participants reported moderate levels of music preference and well-being across both cultural groups.

TABLE 2 Descriptive statistics for the main study variables.

Variable	Group	Mean	SD	N
Well-being (pre-intervention)	British	14.89	6.45	9
Well-being (post-intervention)	British	12.00	7.17	9
Well-being (pre-intervention)	Chinese	14.00	3.36	10
Well-being (post-intervention)	Chinese	8.60	4.19	10
Music preference	British	3.37	0.93	63
Music preference	Chinese	3.29	1.06	63

Well-being scores are reported at the participant level ($N = 19$). Note that a higher KEDS score indicates lower well-being. Music preference ratings are based on daily diary entries across the intervention period (total observations $N = 126$).

A total of 126 diary entries from 19 participants were included in the quantitative analyses. Each entry represented a listening session reported during the week-long intervention and was used to capture participants' momentary emotional responses to BB music. The quantitative analyses were used to explore preliminary patterns in participants' reported well-being scores, music preference, and emotional responses.

Cultural influence on well-being

To examine within-group changes in well-being following the intervention, exploratory paired-samples *t*-tests were conducted comparing pre- and post-intervention KEDS scores within each cultural group. Results indicated significant reductions in KEDS scores among both British participants, $t(8) = 2.83$, $p = .022$, and Chinese participants, $t(9) = 4.59$, $p = .001$, across the listening period. Pre-intervention KEDS scores did not differ significantly between the two cultural groups, $F(1,17) = 1.28$, $p = .236$. Exploratory quantitative analyses also did not provide clear evidence of substantial group-level differences in reported well-being outcomes across the listening period.

Music preference and well-being

Exploratory analyses suggested a small positive association between music preference and self-reported well-being experiences ($r = .226$, $p = .011$). Participants who reported greater enjoyment of the music also tended to describe more positive listening experiences during the intervention period. No clear patterns were observed, suggesting substantial differences in reported well-being experiences across the different music categories.

Descriptive patterns in music preference

Across the 126 diary responses collected during the seven-day listening period, descriptive differences in music preference categories were observed between participant groups (see Figure 1). Positive and Uplifting music accounted for approximately 48% of diary responses among British participants, whereas Calm and Soothing music accounted for approximately 46% of responses among Chinese participants. Responses associated with the High Energy and Intense category were reported less frequently across both participant groups overall.

Qualitative findings

This section presents a thematic analysis of participants' emotional engagement with BB music during the listening period, with particular attention to familiarity, listening experiences, music preference, and emotional interpretation. For clarity, British participants are designated as "B1–B9", while Chinese participants are identified as "C1–C10".

Cultural differences in emotional responses

British participants (88%) described BB music as calming and immersive, frequently associating it with relaxation and deep concentration. For example, B2 noted, "I found the BB music quite calming, like something I'd use for meditation or deep work". Similarly, B5 described it as "stepping into a space where I could disconnect and focus". By contrast, Chinese participants showed a more diverse distribution of responses. While 60% of participants also reported calming and relaxing effects, 20% described the music as inducing drowsiness, 10% reported increased stress, and a further 10% indicated that certain tracks evoked feelings of unease or fear. For instance, C6 remarked, "I don't know why, but this type of music made me feel empty, almost lonely".

The role of music preference

To further explore the impact of familiarity, participants with prior exposure to instrumental or electronic music were more likely to positively engage with BB music. Specifically, 83% of participants with prior exposure reported positive engagement, compared to 43% of those without such exposure. These figures reflect different participant subgroups and are therefore presented descriptively rather than as directly comparable proportions. For example, B4, who enjoyed ambient music, stated, "This wasn't a huge jump for me". Conversely, those who preferred melodic, structured compositions struggled to connect with it. Approximately 21% of these participants reported difficulty engaging with BB music. C5 noted, "I expected something more dynamic, like a melody or rhythm". Additionally, enjoyment ratings were associated with emotional responses. B6 emphasized, "I liked it, so naturally, I felt more in the zone", whereas C4 remarked, "I just couldn't connect with it, so it didn't do much for my mood".

Perceived potential for emotional support

When examining perceived potential for emotional support, 66% of British participants expressed openness to incorporating BB music into their routines, viewing it as a practical tool for relaxation and focus. For example, B9 noted, "I could see myself using this before bed or while studying". In contrast, 50% of Chinese participants expressed reservations about adopting BB music, favoring structured or familiar music. C10 stated, "It's interesting, but I wouldn't switch from my usual playlist". Additionally, 36% of participants suggested that prolonged exposure might increase familiarity with BB music, indicating a degree of uncertainty or need for further familiarization. As C8 explained, "Maybe I need more time to get used to it".

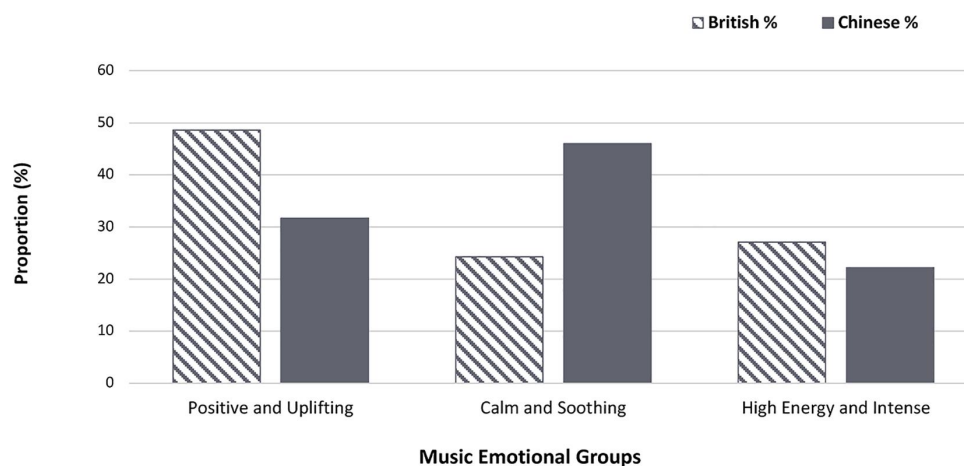


FIGURE 1

Descriptive patterns in music preference responses across participants during the listening period. This bar chart presents the proportion of diary responses associated with each music category across the seven-day listening period ($N = 126$ diary responses).

Discussion

This exploratory study examined how participants from different cultural backgrounds emotionally engaged with and interpreted BB music within an everyday week-long listening context alongside assessing the impact on their self-reported well-being. The quantitative findings suggested improvements in well-being experiences across both participant groups, whilst the qualitative findings revealed considerable variation in how participants experienced and emotionally connected with the listening environment. Rather than responding uniformly to the auditory stimuli, participants' engagement with the listening experience can be interpreted in part through prior listening habits, expectations, and familiarity with different forms of music listening, all of which may shape how emotional and expressive meaning is experienced within unfamiliar listening environments.

Emotional engagement in unfamiliar listening contexts

Participants differed substantially in how they emotionally responded to the BB listening environment. Some participants described the music as calming, immersive, or emotionally supportive, while others reported difficulty emotionally connecting with the listening experience, describing it as emotionally distant, unfamiliar, or unsettling. These contrasting responses suggest that emotional engagement with BB music cannot be understood as a uniform or automatic response to the auditory stimulus itself.

One possible explanation for these differences relates to listeners' prior listening experiences and familiarity with ambient or minimally structured forms of music listening. Participants who reported regularly engaging with instrumental, electronic, ambient, or meditation-oriented music appeared

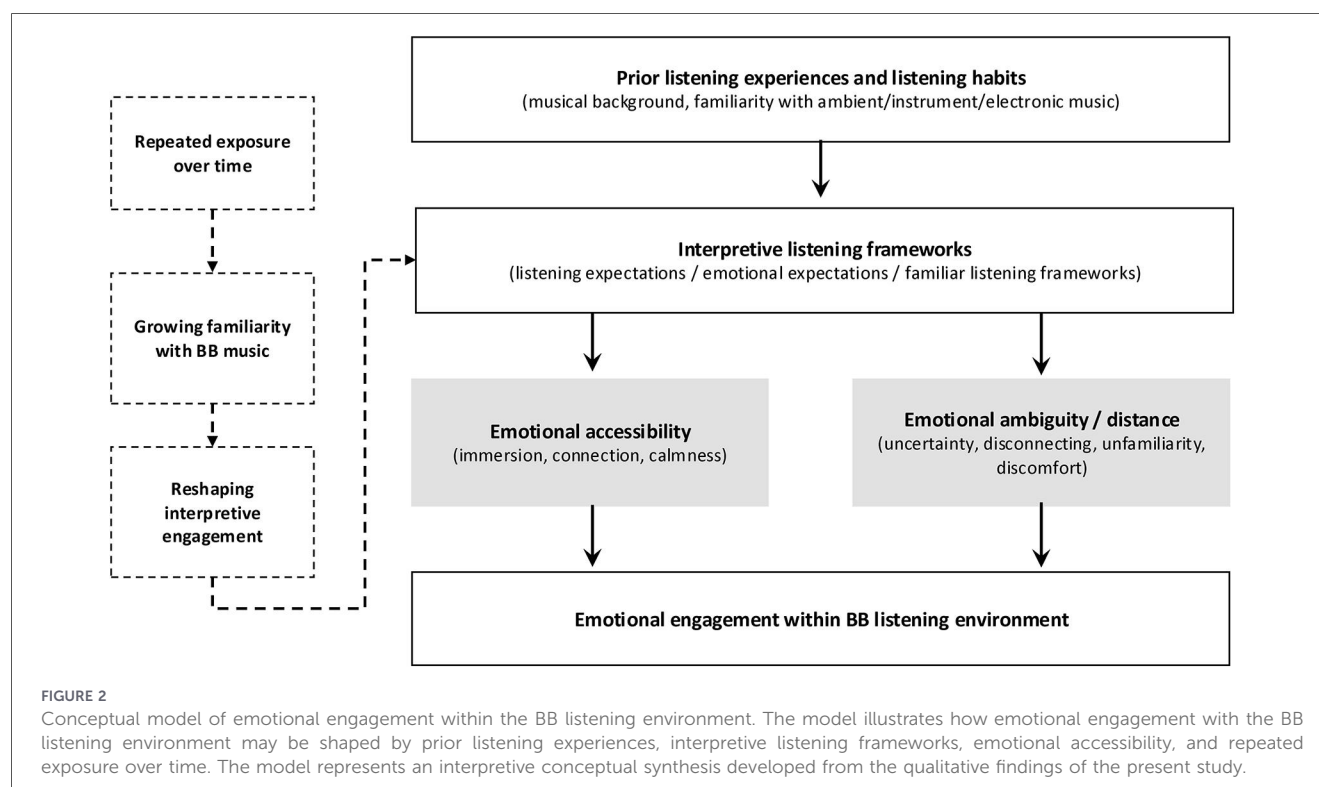
more able to emotionally engage with the listening environment. By contrast, participants whose listening preferences centred around more structured melodic or lyrical music often described difficulty connecting with the auditory experience. This finding aligns with previous research suggesting that familiarity, listening context, and music preference play important roles in shaping emotional responses to music (Saarikallio, 2012; Saarikallio et al., 2021; Schäfer et al., 2013).

These findings may also be understood through ecological perspectives of music listening, which propose that emotional and expressive meaning emerges through interactions between listeners, prior experiences, and listening environments rather than through musical stimuli alone (Clarke, 2005). Similarly, Juslin and Västfjäll (2008) argue that emotional responses to music involve multiple interacting psychological mechanisms, including expectation, memory, and contextual interpretation. From this perspective, participants' responses may reflect differences in emotional and expressive accessibility to unfamiliar listening environments rather than direct reactions to the acoustic properties of BB music itself.

Taken together, the findings suggest that emotional engagement with BB music may be shaped partly by the degree to which listeners possess familiar listening frameworks through which the auditory environment can be understood and emotionally navigated. Emotional engagement, therefore, appeared to emerge through interactions between prior listening experiences, familiarity, expectations, and repeated exposure over time (see Figure 2).

Beyond functional outcomes

The findings also raise broader questions regarding how music-based well-being interventions are conceptualized and



measured within music psychology research. Existing intervention-based studies frequently evaluate outcomes such as stress reduction, relaxation, mood improvement, or emotional regulation (Adiasto et al., 2022; Harney et al., 2023; Hillebrand et al., 2023; Thoma et al., 2012). While such approaches provide valuable evidence regarding intervention outcomes, the present findings suggest that emotional engagement with music-based interventions offers a valuable insight into interpretive and contextual processes that need to be taken into account in order to better understand the link between music exposure and psychological impacts.

Importantly, participants did not engage with the listening experience solely through the sonic characteristics of the music itself. Rather, they approached the intervention through their unique pre-existing expectations surrounding digitally mediated well-being technologies, particularly as the listening experience was delivered through a well-being-oriented application. Such expectations may have shaped how participants positioned and interpreted the listening experience, including assumptions relating to relaxation, emotional regulation, concentration, or therapeutic listening.

This perspective aligns with research suggesting that music listening functions not only as emotional regulation but also as a process through which listeners construct emotional meaning within everyday life (DeNora, 2000; Krause et al., 2021b). From this perspective, music-based interventions may not simply “produce” emotional outcomes through auditory stimulation alone. Instead, the findings suggest that such interventions may function as interpretive and contextually mediated listening experiences rather than purely stimulus-driven auditory effects.

Importantly, the findings may therefore reflect broader responses to ambient and technologically mediated listening environments rather than responses attributable specifically to binaural beat stimulation. This distinction is particularly important given the ongoing methodological debates surrounding the specificity and efficacy of BB effects within existing literature (Garcia-Argibay et al., 2019; López-Caballero and Escera, 2017).

Limitations and future research directions

Several limitations should be considered when interpreting the findings of the present study. First, the small sample size ($n = 19$) and exploratory design limit the extent to which the findings can be generalized beyond the present context. In addition, the absence of a control comparison condition means that the reported emotional and well-being experiences cannot be directly interpreted in relation to any single attribute of the musical stimulus.

The study design may also have influenced how participants interpreted and reported their experiences. The use of reflective diary entries encouraged participants to attend closely to their emotional states throughout the listening period, potentially shaping processes of emotional reflection and self-monitoring throughout the listening process (Pennebaker, 1997). As such, participants’ responses may have emerged not only through music listening but also through reflective engagement with the listening experience itself.

Furthermore, diary entries represented repeated observations nested within participants across the listening period and,

therefore, should not be interpreted as statistically independent observations. Future research may benefit from using multilevel or mixed-effects approaches to better account for within-participant variation across repeated listening sessions.

Future studies could further explore how familiarity, repeated exposure, listening habits, and listening contexts shape emotional engagement with technologically mediated music listening environments over longer periods of time and across more diverse participant groups.

Conclusion

This exploratory study examined how participants from different cultural backgrounds emotionally engaged with and interpreted BB music within an everyday listening context. Although participants across both groups reported improvements in well-being experiences during the listening period, substantial variation emerged in how listeners emotionally connected with the listening environment itself. The findings suggest that emotional engagement with BB music may depend not only on the sonic characteristics of the music but also on listeners' prior listening experiences, familiarity, expectations, and culturally shaped listening practices.

Rather than functioning as a universally experienced auditory intervention, BB music in this context became emotionally meaningful through the unique ways that individual listeners interpreted and related to the listening context. Taken together, the study contributes to emerging discussions surrounding emotional engagement, expressive meaning-making, and interpretation within technologically mediated music listening environments.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

JZ: Writing – review & editing, Conceptualization, Investigation, Writing – original draft, Methodology, Visualization, Formal analysis. VJW: Writing – review & editing.

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Conflict of interest

VJW is affiliated with Audicin Oy (<https://www.audicin.com>), the company that developed the Audicin application used in this study. Audicin Oy provided access to the application and backend track data used during the research. No financial support was received for this study, and the research design, analysis, and interpretation of the findings were conducted independently.

The remaining author(s) declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

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