Current Psychology (2026) 45:586
https://doi.org/10.1007/s12144-025-08990-7

Examining the impact of brief exposure to happy and sad music on ostracism recovery

Sydney G. Wicks[1] · Andrew H. Hales[1]

Received: 20 September 2024 / Accepted: 19 December 2025

Abstract
Ostracism—being ignored and excluded—is a common experience. Although people often seek to recover from this experience, the effectiveness of brief music listening and whether this activity offers benefit beyond distraction are unknown. Thus, this study investigated the effectiveness of short-term exposure to happy and sad music on ostracism recovery relative to other distracting noise. After being ostracized, participants ($N = 561$) were randomly assigned to one of four audio listening conditions. Subsequently, they rated their satisfaction with psychological needs (belonging, self-esteem, meaningful existence, control, and certainty). Music—particularly happy music—was effective in improving one's needs relative to a control baseline (but not distraction) condition. We examined whether effects of music were mediated through greater parasocial experiences (feeling a psychological bond to the audio), reduced rumination (thinking less about their exclusion), and/or heightened emotional engagement (being moved by the audio). Happy and sad music were shown to be similarly effective as other distracting noise in reducing rumination. Compared to baseline, the positive effects of distraction and music conditions on needs were explained by reduced rumination. Although music and distraction conditions led to similar amounts of recovery, there were benefits uniquely associated with music. In line with our theorizing, both happy and sad music provided greater parasocial experiences compared to the baseline. Findings highlight the role of happy—and sad-sounding—music as a potential substitute for social connection, suggesting that music improves basic psychological needs through a mechanism that other noise may not.

Keywords Ostracism · Music · Parasocial · Rumination · Emotional engagement · Social exclusion

Examining the impact of brief exposure to happy and sad music on ostracism recovery

Ostracism—being ignored and excluded—is a common experience that causes pain, leads to negative affect, and threatens basic psychological needs (Williams, 2009), making it important to identify effective strategies that help restore those needs. This form of exclusion has been referred to as a form of social or symbolic death (e.g., Hales, 2018). In a related vein, lacking close relationships also poses a mortality risk comparable to major health risks such as alcohol consumption and cigarette smoking (Holt-Lunstad et al., 2010; House et al., 1988). Further, previously excluded individuals are more sensitive to social cues, craving forms of social interaction (Pickett et al., 2004), and may be more accepting of negative interactions, such as hostile acknowledgement (Rudert et al., 2017) and catcalling (Dvir et al., 2021). Because one's sense of social connection is reflected in how satisfied they feel in their needs (e.g., belonging), people often seek ways to restore those needs after aversive experiences such as exclusion. In this study, we examine whether brief exposure to music can help restore psychological needs following ostracism.

Existing research and theorizing would suggest that music should be effective in making people feel better from negative events (e.g., Derrick et al., 2009) and that music may offer opportunities for social connection specifically (Ayyildiz et al., 2025; Gabriel & Paravati, 2021). Despite this, little is known of music's actual effectiveness in restoring needs following an ostracism experience. We investigate whether different varieties of music (happy and sad) have measurable positive effects beyond just their distracting

✉ Sydney G. Wicks
swicks@go.olemiss.edu

[1] Department of Psychology, University of Mississippi, Oxford, MS 38677, USA

Published online: 24 February 2026

properties, and whether these effects are mediated by three candidate mechanisms: reduced rumination, increased emotional engagement, and greater parasocial experiences. Although various ways in which one may feel excluded (as well as negative consequences that follow) have been well documented in the literature, it is also important to examine strategies that may be effective in helping people recover following exclusion's immediate sting. To this end, we investigate one strategy, listening to music, as a potential aid to restoring basic needs following an ostracism experience. We posit that listening to music is one strategy for restoring previously threatened needs and that music may aid recovery not only by redirecting attention away from the negative experience but also by offering additional benefits, such as emotional engagement and a sense of connection.

Ostracism

To understand how music could improve recovery following ostracism, we are informed by the temporal need-threat model of ostracism (Williams, 2009). According to the model, upon its detection, responses to ostracism unfold in a series of three sequential stages. Immediately following the detection of exclusion, people enter the first, reflexive stage, in which they experience pain, negative emotions, and harmful consequences of having their needs threatened. In the second, reflective stage, ostracized individuals focus their attention on improving these needs and regaining some sense of connection—be it from either those they were previously ostracized from or from entirely new others. If a social connection cannot be established, ostracized individuals may give up and further alienate themselves in the third, resignation stage (e.g., Riva et al., 2017).

Ostracism thwarts fundamental human needs for belonging, self-esteem, meaningful existence, and control (Williams, 2009). Recent theorizing has also documented that ostracism causes a uncertainty about oneself and the environment, also threatening one's need for certainty (Hales & Williams, 2018, 2021; Wesselmann et al., 2015). In addition to exclusion causing physical pain, it also produces *social* pain, with the latter being shown to last longer and be more easily re-experienced (Chen & Williams, 2011; Meyer et al., 2015). According to the need-threat model, in the immediate reflexive stage, ostracism causes a large and relatively unmoderated threat: it tends to hurt the same for most people. However, people vary in the rate at which they recover. For example, socially anxious people recover more slowly than less anxious people (Zadro et al., 2006). For this reason, we reasoned that music would be most effective when provided *after* the ostracizing experience while one is still in the reflective stage, seeking to fortify their previously threatened needs. Thus, the current work examines the effectiveness of music, specifically in the reflective stage (i.e., the minutes following exclusion).

Music and (Restoring) social connection

Following social exclusion, people often search for ways to fortify their threatened needs, initially seeking out positive connections (e.g., friends) following the event (Gardner et al., 2005). When actual social connection is unavailable, they may settle for reminders or fragments of social connection in whichever way they can find them. These fragments of social connection can take a variety of forms. Similarly, various media tools are effective in helping people recover from social exclusion and regulate their emotions (for review, see Lutz et al., 2022). The social surrogacy hypothesis suggests that individuals can treat common technologies (e.g., books, television) as temporary substitutes (or surrogates), providing an experience of belonging (Derrick et al., 2009). It is plausible that, by creating a form of social connection to these surrogates, individuals would be better able to cope with the negative experience of being excluded. Other psychological needs may be influenced by musical engagements. For instance, music also may affect one's sense of meaning by facilitating opportunities for narrative building and personal reflection (Hargreaves et al., 2012; Herff et al., 2021). Relatedly, other types of audio (e.g., podcasts) have been linked with a greater sense of meaning for those who were more engaged in the listening experience (Tobin & Guadagno, 2022). Further, empowering music has been shown to increase both one's explicit and implicit self-esteem (Elvers, 2016; Elvers et al., 2017), and people tend to perceive themselves as having greater control over future events after listening to powerful music (Hsu et al., 2014).

Music may also improve one's sense of connection by serving as a social surrogate. This possibility is suggested by the music and social bonding hypothesis, an interdisciplinary framework that posits that human musicality evolved through gene–culture coevolution to facilitate social bonding across multiple contexts, ranging from dyads to large groups (Savage et al., 2021). According to the music and social bonding hypothesis, the "core biological components of human musicality" (Savage et al., 2021, p. 3) evolved as means to form and strengthen social bonding among people. This framework accounts for both the biological and cultural evolution of music as well as their intertwining, co-evolving relationship, positing that music evolved as a way to strengthen one's social network, and in turn, improve the quality and quantity of their relationships. Evolutionarily, music may have emerged to extend and sustain social bonds as relationships increased in size and complexity beyond what earlier bonding behaviors like grooming could support

(Savage et al., 2021). Culturally, music exists in some form within every society and is widely used in communal rituals and ceremonies across cultures (Koelsch, 2014; Mehr et al., 2019). Consistent with the music and social bonding hypothesis, a meta-analysis of neuroimaging studies revealed overlapping activation patterns during the processing of music and social signals (Nummenmaa et al., 2021), suggesting that music may function as simulated sociability. Given this overlap, music effectively operates as a social cue. It is therefore reasonable to expect listening to music to increase one's sense of connection and thus help recover from exclusion.

The potential role of emotional Valence

Valence of music–such as whether it feels relatively happy versus sad–plays an important role in the functionality of music in everyday life (e.g., Schäfer et al., 2013). Accordingly, this work explored whether happy and sad music differ in their effectiveness in promoting recovery following ostracism. Straightforwardly, happy music is associated with positive moods and is commonly used to elevate mood or counteract negative emotional states (e.g., Ferguson & Sheldon, 2013). Upbeat, energizing qualities that are typically associated with happy music may be especially helpful in shifting attention away from the aversive experience by introducing a more engaging, positively valenced focus (Van Goethem & Sloboda, 2011). Because happy music is incongruent with the negative state typically induced by ostracism, it may disrupt negative thought patterns and facilitate mood repair.

However, sad music may be just as beneficial (if not more so), particularly for those who are currently feeling sad, as one often does when they are excluded. Although it may seem counterintuitive, listening to sad music may be beneficial for those already in a negative state (e.g., Schubert, 1996; Taruffi & Koelsch, 2014). For instance, when feeling sad, people prefer music congruent with their current state, and may feel annoyed by unpleasantly chipper music (Hunter et al., 2011). Further, when asked to recall an adverse life event, music identified by participants as sad (but not happy) was associated with greater acceptance of the negative event and emotions (Van den Tol et al., 2016). Additionally, despite its negative valence, sad music has also been shown to be capable of reminding someone of happy memories (Jakubowski & Eerola, 2022). Similar to how people may seek out friends who can empathize with their feelings (Hunter et al., 2011; Lee et al., 2013), those who are excluded may benefit from listening to mood-congruent music. Sad music may also serve as an opportunity to vicariously express one's negative emotions (Chen et al., 2007). Thus, we used two music conditions—with either happy or sad music to examine the effectiveness of happy and sad music as separate strategies that may both be (relatively) effective in helping people recover, and whether either type of music offered additional benefits than distraction.

Proposed mediators

Supposing music helps following ostracism, why would it do so? We examine three potential mechanisms that may explain music's restorative effect on one's basic psychological needs following experiences of exclusion: a sense of parasocial experiences, decreased rumination, and increased emotional engagement.

Parasocial experiences

Listening to music, at least in the physical presence of others, seems like it would serve as a social experience and offer a sense of connection/connectedness (as when one attends a concert or listens with friends; e.g., collective effervescences; Gabriel & Paravati, 2021). However, even individual music listening experiences (e.g., listening to music alone or through headphones) may invoke a type of *social* experience. A song can instill inherently social feelings and mental representations of others. Analogous to how human-like traits are easily attributed to mere triangles and circles on the basis of how they move (as in the classic Heider & Simmel, 1944; Scholl & Tremoulet, 2000), people may also make natural social construals of the music they hear.

This notion is supported by persona theory, which suggests a piece of music can be interpreted as an entity capable of having attitudes and intentions of its own (Levinson, 2006). This interpretation of a musical persona may be represented as an illusory persona inhabiting that *specific* musical environment as well as an extension of the musician. For example, cheerful-sounding music may also be interpreted as the expression of a cheerful entity (i.e., persona) that may offer a potential connection. Indeed, music can be encoded and decoded with attitudes and expressions. For instance, after having expert musical improvisers communicate various non-musical social attitudes (e.g., domineering) to other experts solely through the musical interaction, non-lyrical music was capable of being effectively encoded with attitudes and intentions (Aucouturier & Canonne, 2017). Further, that same audio was able to be *accurately* decoded by listeners, musically-trained or not. It has been suggested that individuals can detect person-like attributes in music as well (e.g., how much the music expressed good/evil-ness; Watt & Ash, 1998). Thus, people appear to be capable of detecting emotions/attitudes expressed within a single piece

of music, even when unfamiliar, with consensus regarding what emotions/attitudes are being expressed.

Drawing from parasocial theory (Horton & Wohl, 1956), we expect that in addition to music serving as an entity that one is able to form a connection to, listening to music (and thus "interacting" with this musical entity) will aid in restoring previously threatened needs. Parasocial theory posits that people are able to derive social benefits from one-sided psychological bonds formed with celebrities, characters, and even illusory personae through mediated communication (radio, TV, etc.; Horton & Wohl, 1956). For instance, people tended to form a closer bond to soap opera characters when they felt they could interpret the characters' attitudes (Perse & Rubin, 1989). Although parasocial experiences are, in some sense, imaginary (and consciously understood as such by the individual), these experiences are commonly interpreted as having elements of mutual, social interactions, thus having a *real* impact on the individual (Lutz et al., 2024; for review, see Tukachinsky Forster, 2023). In summary, because human-like traits may be attributed to music (even when unfamiliar and/or instrumental), we reasoned that listening to music may also offer a sense of closeness (referred to as a parasocial experience), and that this would partially mediate music's benefits in restoring basic needs following ostracism. In addition to offering a parasocial experience, listening to music may (not surprisingly) offer a distraction from the negative event (e.g., Dobbs et al., 2011; Henderson et al., 1945), and thus may reduce the extent one ruminates about the experience.

Rumination

In addition to offering a parasocial experience, another benefit of music is that it can offer a distraction from negative events (e.g., Dobbs et al., 2011; Henderson et al., 1945), which may reduce the extent one ruminates about the experience. Rumination involves repetitively and passively perseverating on an upsetting event (Nolen-Hoeksema, 1991). Although various positive strategies exist that help someone recover after experiencing social exclusion (e.g., Eck et al., 2016), the natural tendency to ruminate about the experience has generally been found to be counter-productive (Wesselmann et al., 2013).

Not only can individuals be negatively impacted by an event itself, but rumination usually makes negative thoughts more salient, worsening one's mood (Lyubomirsky & Nolen-Hoeksema, 1995). Likewise, a lack of positive social connections after the event may further increase the rate at which one ruminates on the event (Nolen-Hoeksema et al., 1997). Research examining the link between rumination and ostracism suggests that people naturally and spontaneously ruminate following the exclusion (Wesselmann et al., 2013) and that rumination predicts slower recovery, such as psychological needs being restored (Hales et al., 2016). From this work, it follows that distracting activities (such as listening to music) will disrupt harmful rumination, thereby promoting social exclusion recovery.

Stemming from this and prior research, strategies that disrupt the process of rumination should have a beneficial effect on needs satisfaction. As such, it stands to reason that similar to how a distracting task may decrease the extent one ruminates on their exclusion (e.g., Hales et al., 2016), music (which offers at least some degree of distraction; e.g., Lutz et al., 2023) may also be effective in decreasing the amount one ruminates on other forms of social exclusion. Given this, we also measured rumination as a potential variable mediating the effect of music on recovery following ostracism.

Emotional engagement

The third possible mediator we examined was the extent in which music offered emotional engagement and made participants feel moved. Music is emotionally engaging, and it can feel good to be moved. As such, this emotionally engaging aspect of music may help explain its potential benefits. Indeed, the beneficial role of music-induced emotional engagement has been previously hypothesized (Welch et al., 2020). One way music may provide this greater sense of emotional engagement is through an opportunity for participants to feel emotions such as the feeling of being moved by the audio. This could occur through the feeling of elevation and transcendence music can provide. For example, kama muta theory posits that the social-relational emotion of "kama muta" (i.e., the feeling of being moved) occurs when a communal sharing relationship suddenly intensifies (Fiske et al., 2017, 2019; Zickfeld et al., 2019), and this results in a greater sense of connectedness.

This type of feeling, kama muta, is often experienced alongside a deep feeling of connectedness that co-occurs with both positive (e.g., joy) and/or negative emotions (e.g., sadness). Across cultures, this feeling of connectedness is most often tied to intense feelings of communal sharing (Zickfeld et al., 2019). Kama muta establishes a sense of unitary identity through intense sensations of communal sharing. While it may occur with emotions such as sadness, intense feelings of kama muta are considered to still be an overall positive experience (Eerola et al., 2018; Huron & Vuoskoski, 2020). In line with this idea of communal sharing, people often feel a strong desire to experience this emotion with others and are motivated to devote themselves to sustaining communal sharing relationships. Through heightened emotional engagement, excluded individuals may benefit from having listened to music (i.e., improvements in the

satisfaction of their needs). As such, we examined this as an additional mediator through which music would impact needs satisfaction recovery.

Current research

Building on prior work documenting the negative consequences of ostracism, the present research investigated whether listening to music serves as an effective recovery strategy. Specifically, we examined (a) if listening to music is more beneficial than other distracting noises in promoting needs satisfaction following ostracism, and (b) if any positive impact of music, particularly happy- or sad-sounding music, operates through mechanisms other than that of simple distraction. In the experiment, all participants were ostracized within a game of Cyberball: an ostracism-induction procedure in which participants are excluded from a ball-tossing game by two virtual confederates. Our experimental design has four conditions, allowing us to compare distracting non-musical audio (distraction condition) to (1) a baseline recovery rate from ostracism (a no-audio, control condition), (2) positively valenced music (happy music condition), and (3) negatively valenced music (sad music condition). Further, this design allowed us to examine differences between the no-audio condition and either music condition in exploratory analyses. We measured basic needs satisfaction as an indicator of recovery, as a potential function of experimental condition. Materials, data, analysis script, and preregistration are available at https://researchbox.org/2295.

Hypotheses

If listening to music is effective overall, then needs satisfaction ratings should be greater in music conditions compared to the control (baseline) condition. Furthermore, if listening to music offers benefits beyond that of directing one's attention away from the negative event (i.e., distraction), needs satisfaction ratings should also be greater in the music conditions than in the distracting non-musical audio condition. Lastly, we hypothesized that parasocial experiences, emotional engagement, and rumination would be mechanisms explaining this relative effectiveness. Even if there are no overall mean differences between music and distraction conditions on the extent they impact needs satisfaction, they may still be effective for different reasons (i.e., distraction operates entirely by reducing rumination, whereas music conditions operate by increasing emotional engagement and/or providing a parasocial experience). The research design allows for this possibility to be explored.

Preliminary study

The current experiment was preceded by a preliminary study ($N = 131$), using similar design, procedure, and materials, but with the primary difference that it was conducted in-person (whereas the main study was a larger experiment conducted online). Full reports of this preliminary study (including the preregistration, original hypotheses, stopping rule, and analysis plan) are available at https://researchbox.org/2295.

As in the main study (full details below), participants were randomly assigned to hear neutral white noise in a control (baseline) condition or listen to either happy music, sad music, or distracting noise and had their respective listening experiences. Critically, this study had a small sample with extremely low power (less 41% power to detect a typical effect size in social psychology). Contrary to the present hypotheses, there was no overall effect of condition on needs satisfaction, $F(3, 127) = 0.89$, $p = 0.448$, $\eta_p^2 = 0.02$.

Nonetheless, there were a few helpful insights gained from this experiment. First, although the omnibus ANOVA was not significant, follow-up planned contrasts showed that, compared to baseline, receiving any type of novel audio, overall, led to reduced rumination, greater emotional engagement, and greater parasocial experiences ($p \leq 0.004$). Those in the two music conditions felt more emotional engagement and reported greater parasocial experiences than those in the distraction condition ($ps < 0.001$). Happy and sad music did not differ from each other in ratings of rumination, emotional engagement, or parasocial experiences ($ps > 0.05$). Second, although underpowered, this study helped establish the procedures to be used in the main study reported below.

Method

Participants and design

We aimed to recruit 600 participants through Prolific to complete an online study. Only Prolific users who indicated in a prior prescreen survey that they had not played Cyberball before were eligible for the study. Using G*Power Version 3.1.9.6 (Faul et al., 2007) and assuming a typical effect size in social psychology ($d = 0.36$; Lovakov & Agadullina, 2021), a power analysis suggested a sample of 600 participants would provide approximately 97% power to detect an overall omnibus condition effect and approximately 87% power to detect an effect between dummy coded conditions of $d \geq 0.36$. The study protocol was approved by the university's Institutional Review Board (23x-242).

Overall, 624 respondents accessed the survey. Participants were excluded if they met any of the following preregistered criteria: (1) did not reconsent to their response being used (including unfinished responses, $n=28$), (2) failed a single-item attention check, directing them which number to select ($n=3$), (3) indicated that they muted the audio for "an extended amount of time" ($n=4$), or (4) indicated that they did not hear the audio at all or had issues hearing the audio ($n=28$). This left a final sample of 561 U.S. adults (M_{Age} = 41.24, SD_{Age} = 14.50; 49% women, 48% men, 2% nonbinary, 1% not indicated in presented options or preferred not to answer; 65% White, 11% Black/African American, 9% Asian, 8% Hispanic/Latinx, 6% Biracial/Multiracial, < 1% Native American, < 1% not indicated).

Procedure

Under the guise of practicing mental visualization skills, participants first played a game of Cyberball (Williams et al., 2000), a virtual ball-tossing game ostensibly played with two other participants online. All participants were excluded: they received the ball twice early in the game and were entirely excluded thereafter. Importantly, for all participants, white noise audio was played throughout the game. This was done so that participants would be accustomed to hearing audio, and so that participants in the baseline condition would (presumably) habituate to the white noise. The game lasted approximately two minutes, containing 22–24 ball throws.

Following Cyberball, participants were randomly assigned to one of the four conditions. Those in the baseline and distracting noise conditions received the prompt, "Please listen to the current audio. After the time has elapsed, the survey will automatically advance." Participants in both music conditions received the prompt, but with the word "audio" substituted for "music." Following their listening experience, participants reported their needs satisfaction. Upon the completion of this measure, participants responded to measures relating to the hypothesized mediators, manipulation/process checks, and provided demographic information. Needs satisfaction was assessed immediately after listening to the audio; however, the order in which potential mediators were presented was randomized. Needs satisfaction was assessed immediately after the listening period to minimize the likelihood of responses being affected by time or the questionnaires asking about the potential mediators. Instructions for scales relating to the mediators directed participants to rate their agreement with statements referring to their thoughts and feelings *during* their listening experience after the game. Participants were fully debriefed and asked to reconsent to the use of their data.

Audio stimuli

For all participants, white noise played in the background during Cyberball. Participants in the control (baseline) condition continued to hear the same white noise during the subsequent listening period, whereas participants in the three other conditions heard novel audio specific to their assigned condition. Listening periods were for 60 s in all conditions. Participants in the distraction condition listened to a recording of random notes played on a piano. Those in the music conditions listened to instrumental excerpts of either previously established happy or sad music shown to be effective in providing emotional engagement, respectively: the music used in the happy music condition was "Hoppipolla" by Sigur Rós; and the sad music condition was "Þú ert sólin" by Ólafur Arnalds (Vuoskoski et al., 2022, p. 9). None of the excerpts used in the study contained lyrics.

Measures

Needs satisfaction

Needs satisfaction was measured using a version of the basic needs satisfaction scale (Williams, 2009) comprised of 15 items (9 reverse scored) on a 7-point scale ranging from 1 (not at all) to 7 (completely) that evaluate belonging, control, self-esteem, meaningful existence, and certainty (e.g., "I feel I have the ability to significantly alter events"; $\alpha=0.96$; Wood et al., 2023). These items were averaged to form a composite needs satisfaction index, where higher scores indicated greater satisfaction of needs.

Parasocial experience

Four items were adapted, with heavy revision, from the parasocial interaction scale (Rubin et al., 1985), to assess the extent participants felt they were having an interaction with a fictional agent: "I envisioned the audio as a person or people I could be connected with", "The audio made me feel as if I were with a friend or friends", "It felt like the audio was a person or group that I could relate to on some level", and "The audio kept me company during the listening experience." Items were on a 7-point scale ranging from 1 (not at all) to 7 (extremely) and averaged to form a single parasocial experience composite score. Higher scores indicated a greater parasocial experience during the listening period ($\alpha=0.90$).

Emotional engagement

To assess the extent one was emotionally engaged during their listening experience, we adapted 6 items (2 reverse scored) from the affect subscale of the music receptivity

scale (α = 0.88; George & Ilavarasu, 2021). Items were modified to apply not just to music but to audio in general (given that some conditions heard non-musical audio; e.g., "The audio 'moved me' and 'touched my heart'"). Items were on a 7-point scale ranging from 1 (not at all) to 7 (extremely) and averaged to form a composite score. Higher scores indicated being more emotionally engaged by the audio.

Rumination

Rumination was measured with 4 items (1 reverse scored; e.g., "While listening to the audio, I was still focused on the online interaction"; Hales et al., 2016). Items were on a 7-point scale ranging from 1 (not at all) to 7 (extremely) and were averaged to form a composite score. Higher scores indicated greater rumination (α = 0.87).

Manipulation and procedure checks

As manipulation checks, participants rated the extent to which they were (a) excluded, (b) ignored, and (c) disliked/rejected during the interaction on a 7-point scale (1 = not at all, 7 = completely). These items were averaged together to form a single exclusion composite score, with greater scores indicating greater exclusion experienced (α = 0.91). Participants were also asked to report the percentage of ball throws they received.

To assess the effectiveness of our audio manipulation, participants were asked to report their ratings of three items (a) "To what extent did your listening experience distract you from your experience in the game?", (b) "The audio sounded joyful", and (c) "The audio sounded sad" on a 7-point scale (1 = not at all, 7 = completely).

Analysis plan

In line with our preregistration, our primary analysis plan involved a regression predicting basic needs from the randomly assigned condition. Condition was represented with three dummy codes comparing the distraction condition (reference group) to the baseline condition (dummy code 1), happy music condition (dummy code 2), and sad music condition (dummy code 3). The three mediating variables were entered simultaneously into a parallel mediation model, with the dummy codes as the predictors and needs satisfaction as the outcome variable. After collecting and observing the results, we also decided to conduct analyses with the baseline condition as the reference group to assess the extent to which the conditions had measurable effects beyond the control group. As preregistered, we also conducted a series of ANOVAs with Tukey post-hoc tests to assess differences across our manipulation and process-check measures.

Results

Preliminary analyses

See Table 1 for means and standard deviations; for correlations among study variables, see Table 2. Although exclusion was not manipulated, as preregistered, we performed two one-way ANOVAs on (1) the averaged response on the ignored/excluded/rejected items and (2) the percentage of ball throws received. As expected, there were no between-group differences in the extent they felt they were excluded, $F(3, 557) = 0.36$, $p = 0.780$, $\eta_p^2 = 0.002$, or the reported percentage of ball throws received, $F(3, 557) = 1.87$, $p = 0.133$, $\eta_p^2 = 0.01$.

Conditions differed in our audio manipulation checks. First, as intended, the audio appeared distracting: There was an effect of condition on the extent participants felt the audio provided an alternative for them to pay attention to, $F(3, 557) = 16.14$, $p < 0.001$, $\eta_p^2 = 0.08$. See Table 3 for all Tukey post-hoc test results. Music conditions were shown to be similarly distracting as the general distracting noise with participants from these three conditions reporting greater distraction than those in the baseline group. Additionally, participants in the sad music condition reported greater endorsement of this item than those in the happy music condition. There was also an effect on endorsements of how joyful, $F(3, 557) = 87.60$, $p < 0.001$, $\eta_p^2 = 0.32$,

Table 1 Means (standard deviations) of variables

Variable	Overall (N = 561)	Baseline (n = 118)	Distraction (n = 146)	Happy Music (n = 150)	Sad Music (n = 147)
Exclusion	5.43 (1.56)	5.49 (1.52)	5.32 (1.78)	5.41 (1.49)	5.49 (1.45)
% of throws received	10.70 (9.68)	11.10 (12.50)	10.10 (9.03)	12.00 (10.30)	9.54 (6.48)
"The audio gave me something to pay attention to"	4.47 (1.81)	3.58 (2.01)	4.55 (1.70)	4.51 (1.74)	5.06 (1.54)
"The audio sounded joyful"	3.15 (1.95)	2.19 (1.51)	2.39 (1.56)	4.93 (1.63)	2.86 (1.72)
"The audio sounded sad"	3.78 (2.16)	3.00 (2.08)	5.12 (1.68)	2.16 (1.50)	4.71 (1.84)
Needs satisfaction	4.33 (1.50)	4.05 (1.51)	4.36 (1.49)	4.60 (1.49)	4.27 (1.49)
Rumination	3.35 (1.65)	3.78 (1.70)	3.31 (1.68)	3.22 (1.62)	3.16 (1.55)
Emotional engagement	3.36 (1.51)	2.79 (1.49)	3.36 (1.39)	3.34 (1.53)	3.83 (1.51)
Parasocial experience	2.73 (1.53)	2.39 (1.59)	2.69 (1.49)	2.91 (1.51)	2.86 (1.49)

Table 2 Correlations among main variables

Variables	2.	3.	4.	5.	6.	7.	8.	9.
1. Exclusion	-0.39***	0.12**	-0.07	0.16***	-0.44***	0.31***	0.04	0.03
2. % of throws received		-0.01	0.10*	-0.06	0.13**	-0.05	0.05	0.10*
3. "The audio gave me something to pay attention to"			0.36***	0.09*	0.00	0.11**	0.60***	0.43***
4. "The audio sounded joyful"				-0.49***	0.15***	-0.05	0.41***	0.38***
5. "The audio sounded sad"					-0.22***	0.12**	0.01	-0.01
6. Needs satisfaction						-0.35***	0.01	0.03
7. Rumination							0.11***	0.25***
8. Emotional engagement								0.65***
9. Parasocial experience								

*$p<0.05$. **$p<0.01$. ***$p<0.001$

and sad, $F(3, 557) = 90.83$, $p<0.001$, $\eta_p^2 = 0.33$, the audio sounded. As expected, those in the happy music condition reported greater endorsement for the joyful item than those in the sad music condition; those in the sad music condition reported greater endorsement for the sad item than those who heard happy music. Participants in the distraction and sad music conditions did not differ in their endorsements of either of these two items. Although endorsement of the joyful item was (expectedly) highest among those who heard happy music, the distracting noise appeared overall to be interpreted as slightly negative.

Confirmatory analyses

Needs satisfaction

As predicted, there was an overall effect of condition on needs satisfaction[1], $F(3, 557)=3.08$, $p=0.027$, $R^2=0.02$ (see Fig. 1). The baseline group reported the lowest needs satisfaction, and the happy music condition reported the highest, with distraction and sad music falling in the middle. Contrary to our expectations, specific dummy codes did not show a significant difference in basic needs between baseline versus distraction, $t(557) = -1.66$, $p=0.098$, $d = -0.20$, happy music to distraction, $t(557)=1.39$, $p=0.165$, $d=0.16$, or sad music to distraction, $t(557) = -0.49$, $p=0.622$, $d = -0.06$.

[1] Consistent with the preregistration, the analyses reported here excludes participants who indicated experiencing issues with their audio ($n=28$). Of those excluded, 24 of them were in the baseline condition. Following suggestions by Cunningham (2013) and to assess for potential confounds, analyses were replicated with those 28 participants included. Overall mediating paths were not considerably different. It is possible that participants felt distracted by what they believed to be issues with their audio. In line with our original expectations, if participants were momentarily distracted, they would also be likely to report lower ratings of rumination which would be associated with higher needs satisfaction ratings. Analyses including those who indicated experiencing audio-related issues are reported in the supplemental materials.

Effects on proposed mediators

There was an overall effect of condition each of the three mediators: rumination, $F(3, 557)=3.78$, $p=0.010$, $R^2=0.02$, emotional engagement, $F(3, 557)=11.01$, $p<0.001$, $R^2=0.06$, and parasocial experiences, $F(3, 557)=3.15$, $p=0.024$, $R^2=0.02$ (see Table 1 for means and standard deviations).

The distraction group ruminated less than the baseline group, $t(557)=2.32$, $p=0.020$, $d=0.28$. Those in the two music conditions did not ruminate significantly different from the distraction group (happy: $t(557) = -0.49$, $p=0.623$, $d = -0.06$; sad: $t(557) = -0.82$, $p=0.411$, $d = -0.10$). The distraction condition experienced greater emotional engagement than the baseline condition, $t(557) = -3.13$, $p=0.001$, $d = -0.40$, and those in the sad music condition reported greater emotional engagement than the distraction condition, $t(557)=2.76$, $p=0.005$, $d=0.33$. However, emotional engagement ratings did not significantly differ between happy music and distraction conditions, $t(557) = -0.10$, $p=0.919$, $d = -0.01$, contrary to expectations. Parasocial experiences did not differ when comparing baseline to distraction, $t(557) = -1.61$, $p=0.108$, $d=0.20$. Contrary to expectations, music conditions did *not* provide greater parasocial experiences than distraction, happy: $t(557)=1.27$, $p=0.206$, $d=0.15$; sad: $t(557)=0.98$, $p=0.327$, $d=0.12$.

Mediation analysis

As preregistered, the three proposed mediating variables (rumination, emotional engagement, and parasocial experience) were entered into a parallel mediation analysis using Process model 4 (Hayes, 2022), with the three dummy codes as the predictor variables and needs satisfaction as the outcome variable. Figure 2 reports the unstandardized coefficients. As predicted, the indirect effect of the distraction condition (compared to baseline) was mediated through reduced rumination, such that those in baseline reported

Table 3 Follow-up test results and confidence intervals around standardized mean difference

Variable	Follow up test-result	95% Confidence intervals
"The audio gave me something to pay attention to"		
Baseline v. Distraction	$t(557) = -4.51$, $p < 0.001$, $d = -0.56$	[-0.80, -0.31]
Baseline v. Happy Music	$t(557) = -4.37$, $p < 0.001$, $d = -0.54$	[-0.78, -0.29]
Baseline v. Sad Music	$t(557) = -6.90$, $p < 0.001$, $d = -0.85$	[-1.10, -0.60]
Distraction v. Happy Music	$t(557) = 0.17$, $p = 0.998$, $d = 0.02$	[-0.21, 0.25]
Distraction v. Sad Music	$t(557) = -2.52$, $p = 0.057$, $d = -0.29$	[-0.52, -0.06]
Happy Music v. Sad Music	$t(557) = -2.71$, $p = 0.035$, $d = -0.31$	[-0.54, -0.09]
"The audio sounded joyful"		
Baseline v. Distraction	$t(557) = -1.02$, $p = 0.737$, $d = -0.13$	[-0.37, 0.11]
Baseline v. Happy Music	$t(557) = -13.85$, $p < 0.001$, $d = -1.70$	[-1.97, -1.44]
Baseline v. Sad Music	$t(557) = -3.40$, $p = 0.004$, $d = -0.42$	[-0.66, -0.18]
Distraction v. Happy Music	$t(557) = -13.57$, $p < 0.001$, $d = -1.58$	[-1.82, 1.33]
Distraction v. Sad Music	$t(557) = -2.51$, $p = 0.059$, $d = -0.29$	[-0.52, -0.06]
Happy Music v. Sad Music	$t(557) = 11.06$, $p < 0.001$, $d = 1.28$	[1.04, 1.52]
"The audio sounded sad"		
Baseline v. Distraction	$t(557) = -9.68$, $p < 0.001$, $d = -1.20$	[-1.45, -0.95]
Baseline v. Happy Music	$t(557) = 3.85$, $p < 0.001$, $d = 0.47$	[0.23, 0.72]
Baseline v. Sad Music	$t(557) = -7.80$, $p < 0.001$, $d = -0.96$	[-1.21, -0.72]
Distraction v. Happy Music	$t(557) = 14.39$, $p < 0.001$, $d = 1.67$	[1.42, 1.92]
Distraction v. Sad Music	$t(557) = 2.01$, $p = 0.186$, $d = 0.23$	[0.00, 0.46]
Happy Music v. Sad Music	$t(557) = -12.39$, $p < 0.001$, $d = -1.44$	[-1.68, -1.19]
Needs satisfaction		
Baseline (1) v. Distraction (0)	$t(557) = -1.66$, $p = 0.098$, $d = -0.20$	[-0.45, 0.04]
Happy Music (1) v. Distraction (0)	$t(557) = 1.39$, $p = 0.165$, $d = 0.16$	[-0.07, 0.39]
Sad Music (1) v. Distraction (0)	$t(557) = -0.49$, $p = 0.622$, $d = -0.06$	[-0.29, 0.17]
Distraction (1) v. Baseline (0)	$t(557) = 1.66$, $p = 0.098$, $d = 0.20$	[-0.04, 0.45]
Happy Music (1) v. Baseline (0)	$t(557) = 2.98$, $p = 0.003$, $d = 0.37$	[0.12, 0.61]
Sad Music (1) v. Baseline (0)	$t(557) = 1.19$, $p = 0.233$, $d = 0.15$	[-0.10, 0.39]
Rumination		
Baseline (1) v. Distraction (0)	$t(557) = 2.32$, $p = 0.020$, $d = 0.28$	[0.03, 0.53]
Happy Music (1) v. Distraction (0)	$t(557) = -0.49$, $p = 0.623$, $d = -0.06$	[-0.29, 0.17]
Sad Music (1) v. Distraction (0)	$t(557) = -0.82$, $p = 0.411$, $d = -0.10$	[-0.33, 0.13]
Emotional engagement		
Baseline (1) v. Distraction (0)	$t(557) = -3.13$, $p = 0.001$, $d = -0.40$	[-0.65, -0.16]
Happy Music (1) v. Distraction (0)	$t(557) = -0.10$, $p = 0.919$, $d = -0.01$	[-0.24, 0.22]
Sad Music (1) v. Distraction (0)	$t(557) = 2.76$, $p = 0.005$, $d = 0.33$	[0.10, 0.56]
Parasocial experience		
Baseline (1) v. Distraction (0)	$t(557) = -1.61$, $p = 0.108$, $d = -0.20$	[-0.44, 0.05]
Happy Music (1) v. Distraction (0)	$t(557) = 1.27$, $p = 0.206$, $d = 0.15$	[-0.08, 0.38]
Sad Music (1) v. Distraction (0)	$t(557) = 0.98$, $p = 0.327$, $d = 0.12$	[-0.11, 0.35]

greater rumination, which was associated with lowered needs satisfaction (indirect = -0.16 [CI: -0.32, -0.02]). As expected, parasocial experiences and emotional engagement were not significant mediators in explaining the effect of distraction on needs satisfaction. Indirect effects of either music condition on needs (when distraction was the reference group) through the proposed mediators were nonsignificant (see Fig. 3). Ultimately, happy and sad music did *not* have a detectable impact on needs satisfaction when compared to the distraction condition.

Exploratory analysis

To assess each condition's relative effectiveness of happy and sad music conditions as well as compare responses to those of the baseline condition where participants are not

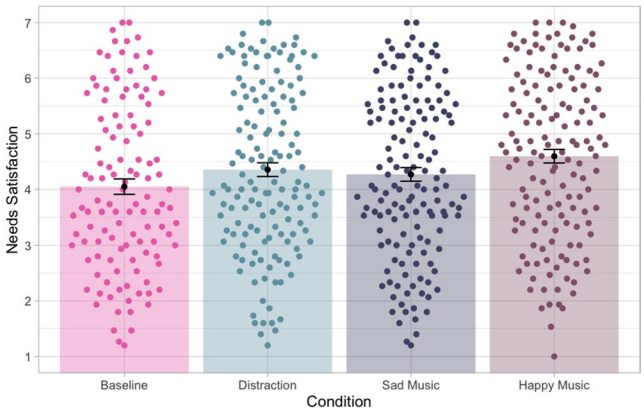

Fig. 1 Needs satisfaction by condition. Dots reflect individual responses. Bars reflect the mean, and the error bars represent ± one standard error of the mean.

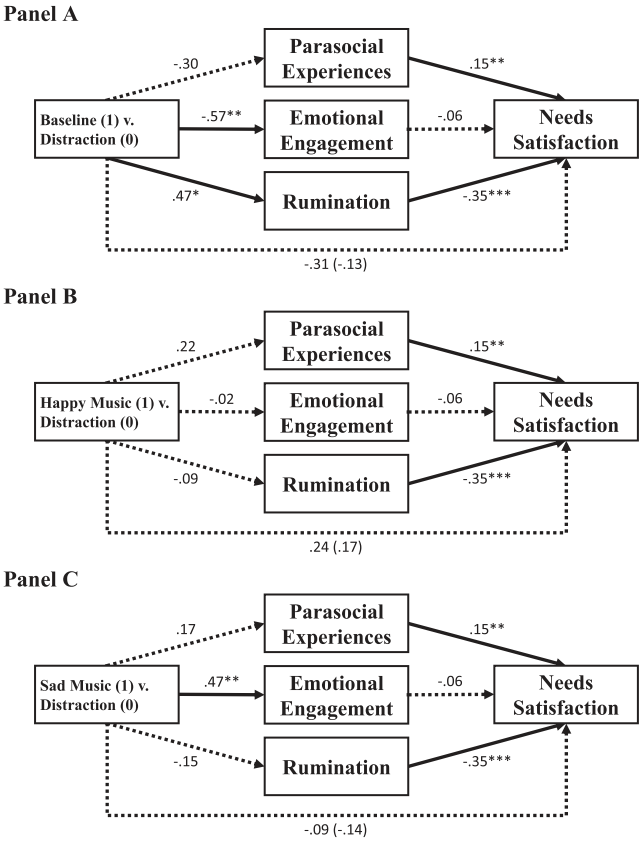

Fig. 2 Exploratory mediation model representing the effect of each predictor (Baseline = 0) on the extent to which participants felt a parasocial experience, were engaged, ruminated, and their needs satisfaction. Parenthesized betas represent the value when parasocial experience, emotional engagement, and rumination are included in the regression. *p < 0.05, **p < 0.01, ***p < 0.001. Baseline (**A**): Parasocial experience: indirect = -0.05 [CI: -0.13, 0.01]; emotional engagement: indirect = 0.03 [CI: -0.03, 0.11]; rumination: indirect = -0.16 [CI: -0.32, -0.02]; Happy Music (**B**): Parasocial experience: indirect = 0.03 [CI: -0.02, 0.11]; emotional engagement: indirect = 0.00 [CI: -0.03, 0.03]. rumination: indirect = 0.03 [CI: -0.10, 0.17]. Sad Music (**C**): Parasocial experience: indirect = 0.03 [CI: -0.03, 0.09]; emotional engagement: indirect = -0.03 [CI: -0.09, 0.03]; rumination: indirect = 0.05 [CI: -0.07, 0.18]

exposed to any noticeable audio (apart from the forgettable white noise), we conducted analyses with baseline set as the reference group.[2] Dummy code predictors revealed that happy music (when compared to baseline) significantly increased needs satisfaction, $t(557) = 2.98$, $p = 0.003$, $d = 0.37$. However, distraction did not, $t(557) = 1.66$, $p = 0.098$, $d = 0.20$, nor did sad music, $t(557) = 1.19$, $p = 0.233$, $d = 0.15$. The three proposed mediating variables (rumination, emotional engagement, and parasocial experience) were again entered into a parallel mediation analysis using Process model 4, with the three new dummy codes as the predictor variables and needs satisfaction as the outcome variable (see Fig. 2).

Compared to the baseline condition, all three listening experiences had an indirect effect on needs satisfaction through rumination, such that participants in those conditions ruminated less about the game, and reduced rumination was associated with greater needs satisfaction (distraction: indirect = 0.16 [CI: 0.02, 0.32]; happy music: indirect = 0.19 [CI: 0.06, 0.34]; sad music: indirect = 0.22 [CI: 0.08, 0.36]). In line with our theorizing, parasocial experiences significantly mediated the effect of both happy (indirect = 0.08 [CI: 0.01, 0.18]) and sad (indirect = 0.07 [CI: 0.01, 0.17]) music on needs satisfaction, but not distraction. In addition to reducing the extent one ruminated about the game, music increased the sense of parasocial experiences, and these greater parasocial experience ratings were associated with higher needs satisfaction ratings. All indirect paths of dummy code to emotional engagement to needs satisfaction were nonsignificant.

Discussion

Music is social. In line with the idea that people often listen to music in hopes of feeling better, this research shows the (relative) effectiveness of this strategy and how music can offer additional benefits compared to other distracting noise. Results from our primary analyses suggest that neither

[2] Additional analyses were conducted to examine the influence of audio condition on each individual psychological need and are reported in the supplemental materials (see Table S1).

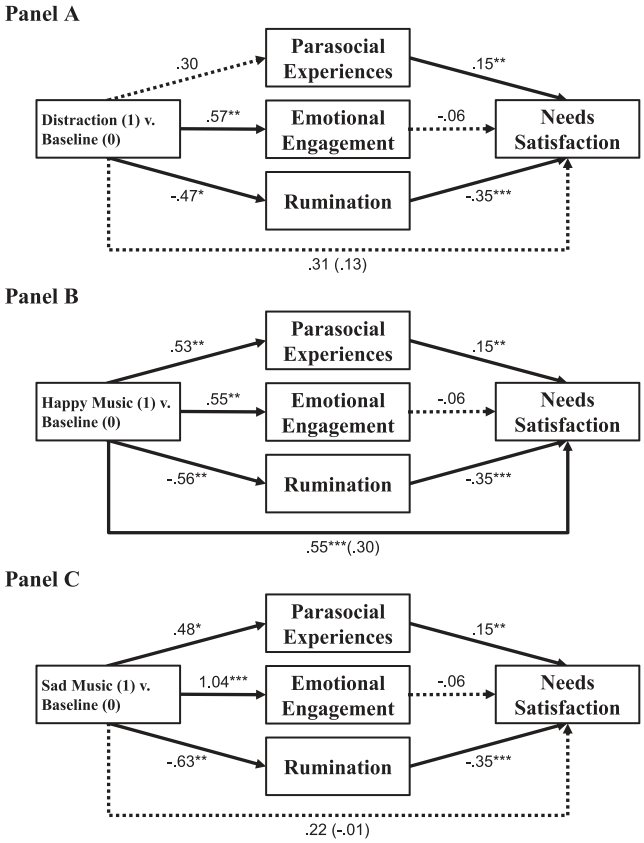

Fig. 3 Preregistered mediation model representing the effect of each predictor (Distraction = 0) on the extent to which participants felt a parasocial experience, were engaged, ruminated, and their needs satisfaction. Parenthesized betas represent the value when parasocial experience, emotional engagement, and rumination are included in the regression. *p < 0.05, **p < 0.01, ***p < 0.001. Baseline (**A**): Parasocial experience: indirect = 0.05 [CI: -0.01, 0.13]; emotional engagement: indirect = -0.03 [CI: -0.11, 0.03]; rumination: indirect = 0.16 [CI: 0.02, 0.32]; Happy Music (**B**): Parasocial experience: indirect = 0.08 [CI: 0.01, 0.18]; emotional engagement: indirect = -0.03 [CI: -0.10, 0.03]. rumination: indirect = 0.19 [CI: 0.06, 0.34]. Sad Music (**C**): Parasocial experience: indirect = 0.07 [CI: 0.01, 0.17]; emotional engagement: indirect = -0.06 [CI: -0.18, 0.06]; rumination: indirect = 0.22 [CI: 0.08, 0.36].

music condition influenced needs satisfaction significantly more than the distraction condition. However, relative to baseline, findings suggest that all three conditions—distraction, happy music, and sad music—indirectly influenced ostracized individual's needs satisfaction, and plausibly through different mechanisms. Ultimately, while music was not shown to necessarily be more beneficial than other distracting noise, happy music was relatively effective in helping people recover from social exclusion (again, when compared to baseline). Furthermore, music and distracting noise influenced needs satisfaction for different reasons. We found partial support for our hypothesized mediators, specifically parasocial experiences and rumination, suggesting that the impact of both happy and sad music operates in part through decreasing the extent one ruminates about their exclusion experience, but also by increasing one's sense that they are interacting with a persona.

In addition to reducing the extent one ruminated about their exclusion, both music conditions offered participants greater parasocial experiences, which were associated with greater needs satisfaction. This analysis was not planned, but the finding is in line with our theorizing that music would lead to greater needs satisfaction ratings. Because this result statistically controlled for the effects of rumination (or its reduction) on needs satisfaction, this suggests that both types of music are providing these additional parasocial benefits above and beyond mere distraction. Contrary to expectations, emotional engagement did *not* serve as a significant mediator, nor did it differ between distraction and happy music conditions. One possible explanation is that the randomness of the notes in the distraction condition created an unpredictable auditory experience, which participants found engaging rather than merely distracting. This could have led to heightened attention and cognitive processing, influencing their emotional engagement ratings. Additionally, the lack of a significant difference in emotional engagement between happy music and the distraction condition suggests that engagement may be driven by factors beyond just valence, such as novelty or unpredictability (Bannister & Eerola, 2023). Importantly, ratings on the parasocial experience measure in the music conditions, though significantly different from the baseline condition, were relatively low overall. Nonetheless, it still mediated the effects of happy and sad music (but not distraction) conditions when compared to baseline. Similar to how people may benefit from even minimal interactions with strangers (e.g., Gunaydin et al., 2021; Leckfor et al., 2023), one minute may have only been enough time for participants to detect a persona during the listening experiences, but not enough for a stronger bond to be established (e.g., Perse & Rubin, 1989).

Limitations and future directions

A limitation of this current work is that all participants were socially excluded. Although this allowed us to maximize resources and better focus on the recovery of needs for those excluded (i.e., where the effect was expected to be strongest), we are not able to claim that these findings are unique to only those excluded (compared to those included). Similarly, the mediation analyses within this work were correlational, so they are unable to definitively show that music-induced parasocial experiences and reduced rumination caused people to feel better, only that the pattern of correlations is consistent with such a relationship. Future research could address these limitations by examining whether these

indirect paths are unique to excluded individuals as well as employing a causal approach to examine pathways. While elements of music such as tempo, rhythm, and lyrics were not the primary focus of this work, different types of music may produce different responses from socially excluded individuals and could change the rate at which they recover. Similarly, lengthening the timing of musical exposure may improve recovery. Future research can also examine the effects of a wider stimulus set of music, building on the relatively narrow two pieces used here.

Implications

While research has examined some benefits associated with listening to familiar, self-selected music (Gabriel & Paravati, 2021; Paravati et al., 2025), it remains unclear whether these effects reflect the qualities of music *itself* or the autonomy of choosing what to hear (e.g., selecting a favorite song). People often turn to music in stressful or lonely moments (Taruffi & Koelsch, 2014), and familiar songs can evoke reminders of past connections, such as romantic relationships (Harris et al., 2020). Yet this work also shows that even unfamiliar music can foster a sense of connection. Outside the scope of music, social surrogates and parasocial experiences can come in a variety of forms (for review, see Lutz et al., 2022; Tukachinsky Forster, 2023). Parasocial experiences—such as those examined in this work—may restore one's psychological needs, reducing the desire to seek alternatives. As a result, individuals may be less likely to engage in further compensatory actions, whether prosocial or antisocial (Mourey et al., 2017; Wesselmann et al., 2015).

In support of persona (Levinson, 2006) and parasocial theories (Horton & Wohl, 1956), individuals were able to (a) interpret the music they heard as an entity capable of conveying attitudes (thus being able to provide a parasocial experience with the music they heard) and (b) benefit from these music-related parasocial experiences. Expanding our understanding of parasocial experiences, which are typically examined within the context of parties that one sees or hears and/or has been repeatedly exposed to, this work offers some evidence that even instrumental, non-lyrical music may still offer a sense of connection. In addition to replicating previous findings that distraction aids in recovery from ostracism (Hales et al., 2016), this research extends it to the context of auditory stimuli. This work offers an additional strategy effective in reducing rumination, adding to our understanding of distraction's role in recovery from social exclusion. In line with the need-threat model (Williams, 2009), music and distracting noises were shown to restore needs to similar extents, offering additional strategies that prevent people from entering the resignation stage.

The widespread availability of technologies such as smartphones and streaming platforms has also expanded access to music (Gopinath & Stanyek, 2014) and other forms of audio (e.g., podcasts; Schlütz & Hedder, 2022). This provides individuals with convenient tools to foster connection and regulate negative emotions. Directed music listening can be incorporated into mental health and wellness practices as an accessible coping strategy for feeling disconnected from others—whether through personal listening, therapeutic interventions, or organizational programs. More broadly, the ubiquity of streaming services creates opportunities to design digital tools that intentionally promote belongingness and reduce the consequences of social exclusion. A strategy to help one feel better after exclusion may be only a few clicks away.

Conclusion

There exist numerous actions one can take to feel better after ostracism. This research offers preliminary evidence that brief exposure to music (especially happy-sounding music) and distracting audio may have a positive influence on excluded individuals' needs satisfaction.

Acknowledgements This research was supported in part by the National Science Foundation Graduate Research Fellowship Program under Grant No. 2235036 awarded to Wicks. We would like to thank C. Veronica Smith and Grace Rivera for feedback on earlier drafts as well as Gerald Wicks for assistance in creating audio stimuli.

Declarations

The authors have no relevant financial or non-financial interests to disclose with respect to the research, authorship, and/or publication of this article. This article is based in part on Sydney Wicks' thesis research. Materials, data, and analysis code are available at https://researchbox.org/2295.

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Aucouturier, J. J., & Canonne, C. (2017). Musical friends and foes: The social cognition of affiliation and control in improvised interactions. *Cognition*, *161*, 94–108. https://doi.org/10.1016/j.cognition.2017.01.019

Ayyildiz, C., Geibel, O., Herff, S. A., Hashim, S., Eerola, T., & Küssner, M. B. (2025). Music as social surrogate? A qualitative analysis of older adults' choices of music to alleviate loneliness. *Musicae Scientiae*, 10298649251319403. https://doi.org/10.1177/10298649251319403

Bannister, S., & Eerola, T. (2023). Vigilance and social chills with music: Evidence for two types of musical chills. *Psychology of Aesthetics Creativity and the Arts*, *17*(2), 242–258. https://doi.org/10.1037/aca0000421

Chen, L., Zhou, S., & Bryant, J. (2007). Temporal changes in mood repair through music consumption: Effects of mood, mood salience, and individual differences. *Media Psychology*, *9*(3), 695–713.

Chen, Z., & Williams, K. D. (2011). Social pain is easily relived and prelived, but physical pain is not. In G. MacDonald & L. A. Jensen-Campbell (Eds.), *Social pain: Neuropsychological and health implications of loss and exclusion.* (pp. 161–177). American Psychological Association. https://doi.org/10.1037/12351-007

Cunningham, J. A. (2013). The systematic removal of participants post-randomization can lead to alternate explanations of the results. *Journal of Medical Internet Research*, *15*(6), e128. https://doi.org/10.2196/jmir.2631

Derrick, J. L., Gabriel, S., & Hugenberg, K. (2009). Social surrogacy: How favored television programs provide the experience of belonging. *Journal of Experimental Social Psychology*, *45*(2), 352–362. https://doi.org/10.1016/j.jesp.2008.12.003

Dobbs, S., Furnham, A., & McClelland, A. (2011). The effect of background music and noise on the cognitive test performance of introverts and extraverts. *Applied Cognitive Psychology*, *25*(2), 307–313. https://doi.org/10.1002/acp.1692

Dvir, M., Kelly, J. R., & Williams, K. D. (2021). The effects of ostracism on perceptions and interpretations of catcalls. *Self and Identity*, *20*(7), 951–959. https://doi.org/10.1080/15298868.2020.1857301

Eck, J., Schoel, C., & Greifeneder, R. (2016). Coping with or buffering against the negative impact of social exclusion on basic needs: A review of strategies. *Social exclusion: Psychological approaches to Understanding and reducing its impact* (pp. 227–249). Springer.

Eerola, T., Vuoskoski, J. K., Peltola, H. R., Putkinen, V., & Schäfer, K. (2018). An integrative review of the enjoyment of sadness associated with music. *Physics of Life Reviews*, *25*, 100–121. https://doi.org/10.1016/j.plrev.2017.11.016

Elvers, P. (2016). Songs for the ego: Theorizing musical self-enhancement. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00002

Elvers, P., Fischinger, T., & Steffens, J. (2017). Music listening as self-enhancement: Effects of empowering music on momentary explicit and implicit self-esteem. *Psychology of Music*, *46*(3), 307–325. https://doi.org/10.1177/0305735617707354

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

Ferguson, Y. L., & Sheldon, K. M. (2013). Trying to be happier really can work: Two experimental studies. *The Journal of Positive Psychology*, *8*(1), 23–33. https://doi.org/10.1080/17439760.2012.747000

Fiske, A. P., Schubert, T., & Seibt, B. (2017). Kama muta or 'being moved by love': A bootstrapping approach to the ontology and epistemology of an emotion. In J. L. Cassaniti & U. Menon (Eds.), *Universalism without uniformity: Explorations in mind and culture* (pp. 79–100).

Fiske, A. P., Seibt, B., & Schubert, T. (2019). The sudden devotion emotion: Kama muta and the cultural practices whose function is to evoke it. *Emotion Review*, *11*(1), 74–86. https://doi.org/10.1177/1754073917723167

Gabriel, S., & Paravati, E. (2021). If music be the food of love, play on: Four ways that music May lead to social connection. *Behavioral and Brain Sciences*, *44*, e71–undefined. https://doi.org/10.1017/S0140525X20001430

Gardner, W., Pickett, C. L., & Knowles, M. (2005). Social snacking and shielding: Using social symbols, selves, and surrogates in the service of belonging needs. In K. D. Williams, J. P. Forgas, & W. V. Hippel (Eds.), *The social outcast* (0 ed., pp. 249–264). Psychology. https://doi.org/10.4324/9780203942888-23

George, M., & Ilavarasu, J. (2021). Development and psychometric validation of the music receptivity scale. *Frontiers in Psychology*, *11*, 585891. https://doi.org/10.3389/fpsyg.2020.585891

Gopinath, S., & Stanyek, J. (2014). *The Oxford Handbook of Mobile Music Studies* (Vol. 1). Oxford Handbooks.

Gunaydin, G., Oztekin, H., Karabulut, D. H., & Salman-Engin, S. (2021). Minimal social interactions with strangers predict greater subjective well-being. *Journal of Happiness Studies*, *22*(4), 1839–1853. https://doi.org/10.1007/s10902-020-00298-6

Hales, A. H. (2018). Death as a metaphor for ostracism: Social invincibility, autopsy, necromancy, and resurrection. *Mortality*, *23*(4), 366–380. https://doi.org/10.1080/13576275.2017.1382462

Hales, A. H., Wesselmann, E. D., & Williams, K. D. (2016). Prayer, self-affirmation, and distraction improve recovery from short-term ostracism. *Journal of Experimental Social Psychology*, *64*, 8–20. https://doi.org/10.1016/j.jesp.2016.01.002

Hales, A. H., & Williams, K. D. (2018). Marginalized individuals and extremism: The role of ostracism in openness to extreme groups. *Journal of Social Issues*, *74*(1), 75–92. https://doi.org/10.1111/josi.12257

Hales, A. H., & Williams, K. D. (2021). Social ostracism: Theoretical foundations and basic principles. *Social psychology: Handbook of basic principles* (3rd ed., pp. 337–349). The Guilford Press.

Hargreaves, D. J., MacDonald, R., & Miell, D. (2012). Explaining musical imaginations: Creativity, performance, and perception. *Musical imaginations: Multidisciplinary perspectives on creativity, performance, and perception* (pp. 1–14). Oxford University Press Oxford.

Harris, C. B., Baird, A., Harris, S. A., & Thompson, W. F. (2020). They're playing our song: Couple-defining songs in intimate relationships. *Journal of Social and Personal Relationships*, *37*(1), 163–179. https://doi.org/10.1177/0265407519859440

Hayes, A. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (Third)*.

Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *The American Journal of Psychology*, *57*(2), 243. https://doi.org/10.2307/1416950

Henderson, M. T., Crews, A., & Barlow, J. (1945). A study of the effect of music distraction on reading efficiency. *Journal of Applied Psychology*, *29*(4), 313–317. https://doi.org/10.1037/h0056128

Herff, S. A., Cecchetti, G., Taruffi, L., & Déguernel, K. (2021). Music influences vividness and content of imagined journeys in a directed visual imagery task. *Scientific Reports*, *11*(1), 15990. https://doi.org/10.1038/s41598-021-95260-8

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A Meta-analytic review. *PLoS Medicine*, *7*(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Horton, D., & Wohl, R. R. (1956). Mass communication and para-social interaction: Observations on intimacy at a distance. *Psychiatry*, *19*(3), 215–229. https://doi.org/10.1080/00332747.1956.11023049

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science (New York N Y)*, *241*(4865), 540–545. https://doi.org/10.1126/science.3399889

Hsu, D. Y., Huang, L., Nordgren, L. F., Rucker, D. D., & Galinsky, A. D. (2014). The music of power: Perceptual and behavioral consequences of powerful music. *Social Psychological and Personality Science*, *6*(1), 75–83. https://doi.org/10.1177/1948550614542345

Hunter, P. G., Schellenberg, E. G., & Griffith, A. T. (2011). Misery loves company: Mood-congruent emotional responding to music. *Emotion*, *11*(5), 1068–1072. https://doi.org/10.1037/a0023749

Huron, D., & Vuoskoski, J. K. (2020). On the enjoyment of sad music: Pleasurable compassion theory and the role of trait empathy. *Frontiers in Psychology*, *11*, 1060. https://doi.org/10.3389/fpsyg.2020.01060

Jakubowski, K., & Eerola, T. (2022). Music evokes fewer but more positive autobiographical memories than emotionally matched sound and word cues. *Journal of Applied Research in Memory and Cognition*, *11*(2), 272–288. https://doi.org/10.1016/j.jarmac.2021.09.002

Koelsch, S. (2014). Brain correlates of music-evoked emotions. *Nature Reviews Neuroscience*, *15*(3), 170–180. https://doi.org/10.1038/nrn3666

Leckfor, C. M., Wood, N. R., Kwiatek, S. M., & Orehek, E. (2023). Expectations and experiences of screen time, social interaction, and solitude. *The Journal of Social Psychology*, 1–16. https://doi.org/10.1080/00224545.2023.2231617

Lee, C. J., Andrade, E. B., & Palmer, S. E. (2013). Interpersonal relationships and preferences for mood-congruency in aesthetic experiences. *Journal of Consumer Research*, *40*(2), 382–391. https://doi.org/10.1086/670609

Levinson, J. (2006). Musical expressiveness as hearability-as-expression. In J. Levinson (Ed.), *Contemplating art: Essays in aesthetics* (pp. 192–206). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199206179.003.0007

Lovakov, A., & Agadullina, E. R. (2021). Empirically derived guidelines for effect size interpretation in social psychology. *European Journal of Social Psychology*, 51(3), 485–504. https://doi.org/10.1002/ejsp.2752

Lutz, S., Schneider, F. M., & Reich, S. (2023). Media as powerful coping tools to recover from social exclusion experiences? A systematic review on need restoration and emotion regulation through using media. *Media Psychology*, *26*(4), 388–413. https://doi.org/10.1080/15213269.2022.2147085

Lutz, S., Schneider, F. M., Reich, S., Schimmel, M., Oechler, H., & Beinlich, L. (2024). Fictional friends and enemies as first aid after ostracism? Experimentally investigating the potential of para-/orthosocial relationships in belongingness need restoration and emotion regulation. *Human Communication Research*, hqae009. https://doi.org/10.1093/hcr/hqae009

Lyubomirsky, S., & Nolen-Hoeksema, S. (1995). Effects of self-focused rumination on negative thinking and interpersonal problem solving. *Journal of Personality and Social Psychology*, *69*, 176–190. https://doi.org/10.1037/0022-3514.69.1.176

Mehr, S. A., Singh, M., Knox, D., Ketter, D. M., Pickens-Jones, D., Atwood, S., Lucas, C., Jacoby, N., Egner, A. A., Hopkins, E. J., Howard, R. M., Hartshorne, J. K., Jennings, M. V., Simson, J., Bainbridge, C. M., Pinker, S., O'Donnell, T. J., Krasnow, M. M., & Glowacki, L. (2019). Universality and diversity in human song. *Science*, *366*(6468), eaax0868. https://doi.org/10.1126/science.aax0868

Meyer, M. L., Williams, K. D., & Eisenberger, N. I. (2015). Why social pain can live on: Different neural mechanisms are associated with reliving social and physical pain. *PLOS ONE*, *10*(6), e0128294. https://doi.org/10.1371/journal.pone.0128294

Mourey, J. A., Olson, J. G., & Yoon, C. (2017). Products as pals: Engaging with anthropomorphic products mitigates the effects of social exclusion. *Journal of Consumer Research*, ucx038. https://doi.org/10.1093/jcr/ucx038

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100*, 569–582. https://doi.org/10.1037/0021-843X.100.4.569

Nolen-Hoeksema, S., McBride, A., & Larson, J. (1997). Rumination and psychological distress among bereaved partners. *Journal of Personality and Social Psychology*, *72*, 855–862. https://doi.org/10.1037/0022-3514.72.4.855

Nummenmaa, L., Putkinen, V., & Sams, M. (2021). Social pleasures of music. *Current Opinion in Behavioral Sciences*, *39*, 196–202. https://doi.org/10.1016/j.cobeha.2021.03.026

Paravati, E., Naidu, E., & Gabriel, S. (2025). Thank you for the music: Music as a social surrogate that protects against social threats. *Psychology of Music*, 03057356241312219. https://doi.org/10.1177/03057356241312219

Perse, E. M., & Rubin, R. B. (1989). Attribution in social and parasocial relationships. *Communication Research*, *16*(1), 59–77. https://doi.org/10.1177/009365089016001003

Pickett, C. L., Gardner, W. L., & Knowles, M. (2004). Getting a cue: The need to belong and enhanced sensitivity to social cues. *Personality and Social Psychology Bulletin*, *30*(9), 1095–1107. https://doi.org/10.1177/0146167203262085

Riva, P., Montali, L., Wirth, J. H., Curioni, S., & Williams, K. D. (2017). Chronic social exclusion and evidence for the resignation stage: An empirical investigation. *Journal of Social and Personal Relationships*, *34*(4), 541–564. https://doi.org/10.1177/0265407516644348

Rubin, A. M., Perse, E. M., & Powell, R. A. (1985). LONELINESS, PARASOCIAL INTERACTION, AND LOCAL TELEVISION NEWS VIEWING. *Human Communication Research*, *12*(2), 155–180. https://doi.org/10.1111/j.1468-2958.1985.tb00071.x

Rudert, S. C., Hales, A. H., Greifeneder, R., & Williams, K. D. (2017). When silence is not golden: Why acknowledgment matters even when being excluded. *Personality and Social Psychology Bulletin*, *43*(5), 678–692. https://doi.org/10.1177/0146167217695554

Savage, P. E., Loui, P., Tarr, B., Schachner, A., Glowacki, L., Mithen, S., & Fitch, W. T. (2021). Music as a coevolved system for social bonding. *Behavioral and Brain Sciences*, *44*, e59. https://doi.org/10.1017/S0140525X20000333

Schäfer, T., Sedlmeier, P., Städtler, C., & Huron, D. (2013). The psychological functions of music listening. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2013.00511. *4*.

Schlütz, D., & Hedder, I. (2022). Aural parasocial relations: Host–Listener relationships in podcasts. *Journal of Radio & Audio Media*, *29*(2), 457–474. https://doi.org/10.1080/19376529.2020.1870467

Scholl, B. J., & Tremoulet, P. D. (2000). Perceptual causality and animacy. *Trends in Cognitive Sciences*, *4*(8), 299–309. https://doi.org/10.1016/S1364-6613(00)01506-0

Schubert, E. (1996). Enjoyment of negative emotions in music: An associative network explanation. *Psychology of Music*, *24*(1), 18–28. https://doi.org/10.1177/0305735696241003

Taruffi, L., & Koelsch, S. (2014). The paradox of music-evoked sadness: An online survey. *PLOS ONE*, *9*(10), 17. https://doi.org/10.1371/journal.pone.0110490

Tobin, S. J., & Guadagno, R. E. (2022). Why people listen: Motivations and outcomes of podcast listening. *PLOS ONE*, *17*(4), e0265806. https://doi.org/10.1371/journal.pone.0265806

Tukachinsky Forster, R. (Ed.). (2023). *The Oxford Handbook of Parasocial Experiences* (1st ed.). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780197650677.001.0001

Van den Tol, A. J. M., Edwards, J., & Heflick, N. A. (2016). Sad music as a means for acceptance-based coping. *Musicae Scientiae*, *20*(1), 68–83. https://doi.org/10.1177/1029864915627844

Van Goethem, A., & Sloboda, J. (2011). The functions of music for affect regulation. *Musicae Scientiae*, *15*(2), 208–228. https://doi.org/10.1177/1029864911401174

Vuoskoski, J. K., Zickfeld, J. H., Alluri, V., Moorthigari, V., & Seibt, B. (2022). Feeling moved by music: Investigating continuous ratings and acoustic correlates. *PLOS ONE*, *17*(1), e0261151. https://doi.org/10.1371/journal.pone.0261151

Watt, R. J., & Ash, R. L. (1998). A psychological investigation of meaning in music. *Musicae Scientiae*, *2*(1), 33–53. https://doi.org/10.1177/102986499800200103

Welch, G. F., Biasutti, M., MacRitchie, J., McPherson, G. E., & Himonides, E. (2020). The impact of music on human development and well-being. *Frontiers in Psychology*, *11*, 1246. https://doi.org/10.3389/fpsyg.2020.01246

Wesselmann, E. D., Ren, D., Swim, E., & Williams, K. (2013). Rumination hinders recovery from ostracism. *International Journal of Developmental Sciences*, *7*, 33–39. https://doi.org/10.3233/DEV-1312115

Wesselmann, E. D., Ren, D., & Williams, K. D. (2015). Motivations for responses to ostracism. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00040

Williams, K. D. (2009). Ostracism: A temporal need-threat model. In M. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 41, pp. 275–314). Elsevier Academic Press. https://doi.org/10.1016/S0065-2601(08)00406-1

Williams, K. D., Cheung, C. K., & Choi, W. (2000). Cyberostracism: effects of being ignored over the Internet. *Journal of Personality and Social Psychology*, 79(5), 748–762. https://doi.org/10.1037//0022-3514.79.5.748

Wood, N. R., Leckfor, C. M., Wicks, S. G., & Hales, A. H. (2023). Ghosting from the workplace: The impact of feedback (or lack thereof) on applicants' psychological needs satisfaction. *Routledge Open Research*, *2*, 3. https://doi.org/10.12688/routledgeopenres.17725.1

Zadro, L., Boland, C., & Richardson, R. (2006). How long does it last? The persistence of the effects of ostracism in the socially anxious. *Journal of Experimental Social Psychology*, *42*(5), 692–697. https://doi.org/10.1016/j.jesp.2005.10.007

Zickfeld, J. H., Schubert, T. W., Seibt, B., Blomster, J. K., Arriaga, P., Basabe, N., Blaut, A., Caballero, A., Carrera, P., Dalgar, I., Ding, Y., Dumont, K., Gaulhofer, V., Gračanin, A., Gyenis, R., Hu, C. P., Kardum, I., Lazarević, L. B., Mathew, L., & Fiske, A. P. (2019). Kama muta: Conceptualizing and measuring the experience often labelled being moved across 19 nations and 15 languages. *Emotion*, *19*(3), 402–424. https://doi.org/10.1037/emo0000450