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Reasons for Listening to Music Vary by Listeners' Anxiety Sensitivity Levels

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Listening to music aids regulation of emotional arousal and valence (positive vs. negative). Anxiety sensitivity (AS; fear of arousal-related sensations) increases the risk for emotion dysregulation and associated coping behaviors such as substance use and exercise avoidance. The

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*relationship between AS and music listening, however, has received very little attention. This study (1) used exploratory factor analysis of 53 items drawn from three previously validated measures of reasons for music listening to identify the core reasons for listening to music among university students and (2) explored associations between AS and reasons for music listening. Undergraduates (**N** = 788; 77.7% women; $\boldsymbol{M}_{age}$ = 19.20, $\boldsymbol{SD}_{age}$ = 2.46) completed the Anxiety Sensitivity Index-3, Motives for Listening to Music Questionnaire, Barcelona Musical Reward Questionnaire, and Brief Music in Mood Regulation Scale. Six core reasons for music listening were identified: Coping, Conformity, Revitalization, Social Enhancement, Connection, and Sensory-Motor. Over and above age and gender, AS was associated with Coping and Conformity—reasons that involve relief from aversive emotions. AS also was associated with listening for Connection reasons. AS was not associated with Revitalization, Social Enhancement, or Sensory-Motor—reasons that involve rewards such as heightened positive emotions. Results suggest that individual differences may influence why people incorporate music listening into their day-to-day lives. Further longitudinal and experimental research is needed to establish directionality and causality in the observed relationship of AS to relief-oriented reasons for music listening. Findings may guide music therapists' efforts to tailor treatment for individuals at risk for anxiety and related mental health problems.*

Keywords: *anxiety sensitivity; emotion regulation; reasons for music listening; relief and rewards; motives*

Music listening offers both rewards and relief (Mas-Herrero et al., 2013). Rewards can include emotional and social enhancement; relief can include avoidance of (or escape from) negative emotions, including aversive arousal. For example, a cross-cultural study by Boer and Fischer (2012), which included 222 participants from across the lifespan, identified various reasons for listening to music, including rewards such as connecting to music emotionally (perceived or induced), social rewards (bonding with friends and family), and personal rewards (using music as entertainment) as well as relief functions such as coping (relieving negative emotions/improving mood). A qualitative study by Saarikallio and Erkkilä (2007) found that adolescents, who tend to be committed music listeners (Saarikallio, 2011), listened to music not only for the rewards of increased arousal (to gain energy) and

entertainment (maintaining positive mood, diversion) but also for relief from negative emotions via catharsis, distraction, and solace.

Following a comprehensive literature review and principal components analysis of 129 items that comprised all previously identified reasons for listening to music, Schäfer et al. (2013) found three primary reasons for music listening among young adults: emotional relief and rewards (inducing or reducing arousal, diversion, and enhancing mood); awareness of self (emotions, coping, solace, and distraction); and social rewards (bonding, affiliation, belongingness, and identity). Lonsdale and North (2011; Study 2) had a large undergraduate sample respond to 30 items describing reasons for music listening derived from the literature. A principal components analysis revealed five higher-order reasons for music listening: emotional relief through coping and self-distraction, emotional rewards, social information gathering, social identity, and self-identity. In a third study, Lonsdale and North adopted a qualitative approach to identify those reasons for music listening that were most important to their undergraduate sample ($N = 189$) *without* reference to the existing literature. Most often cited were listening to music for: emotional relief and rewards, including relaxation and energizing coping with negative mood through catharsis; mood enhancement; and emotional intensification.

Music listening might be particularly attractive for certain individuals, such as those who are highly anxiety sensitive, if they believe it will help them with emotional regulation. Anxiety sensitivity (AS) refers to fear of arousal-related somatic sensations ("fear of fear"; Reiss & McNally, 1985). Higher (vs. lower) AS is a well-known dispositional risk factor for psychological disorders characterized by emotion dysregulation, especially anxiety (Baek et al., 2019) and related disorders, such as depression (Noël et al., 2013), post-traumatic stress disorder (Marshall et al., 2010), and borderline personality disorder (Gratz et al., 2008). Individuals with higher AS tend to catastrophize the meaning of arousal-related physiological sensations (e.g., increased respiration and heart rate, dizziness, and shaking) believing that they signify impending harm, such as a heart attack (physical concerns), loss of control (cognitive concerns), and/or public embarrassment/rejection (social concerns; e.g., Taylor et al., 2007). People with higher AS (i.e., those scoring high on measures like the Anxiety Sensitivity Index-3 [ASI-3]; Taylor et al., 2007) respond to feared somatic sensations

by preventing, avoiding, or escaping situations or triggers that elicit the feared sensations, such as negative emotions (Allan et al., 2015; Taylor et al., 2007) and physical exercise (Sabourin et al., 2011).

In line with Mowrer's two-factor theory of avoidance (e.g., LeDoux et al., 2017; Mowrer, 1960), strategies of prevention, avoidance, and escape may reduce anxiety in the short term. The long-term effects may, however, reinforce AS-related fears by preventing opportunities for learning how to manage such fears effectively. Similarly, because listening to music can immediately reduce negative emotions that drive feared arousal sensations, such as anxiety (Fancourt et al., 2014), anger and stress (Hwang & Oh, 2013), and depression (Chan et al., 2011), individuals with higher AS may use music for immediate relief and thus would likely use music in this way again. Over time, however, reliance on listening to music to manage negative emotional states may prevent the development of more adaptive strategies for dealing with negative emotions, contributing to longer-term maintenance or exacerbation of the negative emotion. For example, Chin and Rickard (2012) found that music listening paired with a strategy of suppression of emotional responses was associated with lower global well-being compared with a strategy of cognitive reappraisal (changing the meaning of a situation to alter its emotional impact), which was associated with higher global well-being. Thomson et al. (2014) found that music listening to relieve negative emotions through discharge (e.g., venting through music) was linked to high levels of depression, anxiety, and stress, and music listening to find relief through distraction was linked to high levels of anxiety and stress. By contrast, music listening for reasons involving rewards such as maintaining and enhancing positive affect (e.g., for entertainment or social enhancement) was associated with lower levels of mental health problems (e.g., lower depression).

People with higher AS may consume arousal-dampening substances such as alcohol (DeMartini & Carey, 2011), sedatives/tranquilizers (Mahu et al., 2019), and heroin (Lejuez et al., 2006) to relieve negative emotions and feared arousal sensations. AS also has been linked to avoidance of arousal-enhancing substances, such as cannabis (e.g., Woicik et al., 2009). Jonker and Kuntsche (2014) investigated relationships between reasons for alcohol use and reasons for listening to music in a sample of 4,481 adolescents. Using alcohol and listening to music to obtain relief from

negative emotions were each associated with lower life satisfaction, poorer self-reported general health, increased feelings of school pressure, somatic complaints, aggressive mood, depressed mood, feeling physically powerless in comparison to one's peers, and being bullied. Listening to music to relieve fears of peer rejection (i.e., conformity) was associated with these negative outcomes in nondrinkers. Jonker and Kuntsche suggested that AS might contribute to a tendency to listen to music for reasons related to relieving negative emotions and accompanying feared arousal states.

The findings outlined above suggest potential therapeutic value in knowing if individuals with higher AS (about 20% of the population; Watt & Stewart, 2008) might listen to music for reasons that could paradoxically maintain or exacerbate their anxiety symptoms in the longer run (i.e., for escape or avoidance). With lifetime adult prevalence rates of approximately 30% (Dalvie et al., 2020), anxiety disorders are the most common mental health problem worldwide. Music therapist awareness of the risks of higher AS could inform development of novel music listening-based treatments or adjunctive interventions.

While several analyses of the reasons for music listening exist in the literature, there is little consensus on the number and nature of these reasons (Boer & Fischer, 2012; Lonsdale & North, 2011; Saarikallio & Erkkilä, 2007; Schäfer et al., 2013). Clarification of the core reasons for music listening was the first objective of the present study, and to achieve this, we conducted an exploratory factor analysis (EFA). A second objective was to examine relations between AS and the core reasons for music listening. Predictions for our second objective were based on Jonker and Kuntsche's (2014) four-factor models of reasons for music listening and alcohol use. Four categories of reasons—coping with (i.e., relief from) negative emotions, social conformity (i.e., relief from fears of peer rejection), enhancing positive mood or well-being (i.e., listening to music for affective rewards, including greater arousal), and social enhancement (i.e., listening to music for social rewards)—are derived from crossing two dimensions: rewards versus relief, and internal versus external source of the desired change. We predicted that higher AS would be associated with listening to music for relief (e.g., coping and conformity) from negative emotions, and unrelated to listening to music for rewards (e.g., as an emotional or social enhancer). Additional analyses explored whether AS might

statistically explain variance in any of the core reasons for music listening above and beyond the variance explained by age and gender.[1] In sum, this study had two purposes: (1) to identify the core reasons for listening to music among university students and (2) to explore associations between AS and core reasons for music listening.

Method

Participants

Participants were 845 students enrolled in introductory psychology courses at two universities (N = 360 and N = 485, respectively). At the first institution, students elected to participate in the study for partial course credit; at the second, students could choose to participate in a broad online mass screening that included the present questionnaires for partial course credit. Participants provided their age, gender, ethnicity, and any diagnosed hearing difficulty that would preclude listening to music. No participants were excluded based on a hearing difficulty. Data from 57 participants were removed due to excessive missing values,[2] questionable response patterns,[3] or absence of consent to record data.[4] The final sample consisted of 788 participants[5] (77.7% women; M_{age} = 19.20 years,

[1] Research shows that the preferred functions of music listening vary across the lifespan (e.g., Groarke & Hogan, 2016; Lonsdale & North, 2011) and by gender (e.g., Groarke & Hogan, 2018; Saarikallio et al., 2012).

[2] Missing values were considered excessive if more than 20% of the items were missing from any single subscale of any measure. For all retained datasets, item-level mean imputation based on each participant's own measure subscale scores was used to replace missing responses.

[3] Questionable responses patterns included highly repetitive and/or extreme responding (n = 14)—for example, cases in which the highest values on the Likert scales were chosen exclusively.

[4] Absence of consent to record data included 29 cases in which participants were under 18 years of age and thus unable to provide consent as an adult; it also included 13 cases in which participants elected in advance to complete the study as unrecorded observers of the research process rather than as participants in the research component. The Research Ethics Board required the latter option to avoid any potential for coerced participation.

[5] Institution 1: n = 346; Institution 2: n = 442. For all participants ≥ 18 years, retained vs. excluded participants did not differ in mean age, $t(25.305) = 1.181$, $p = .248$, 95% confidence interval [–0.991, 3.660], or mean ASI-3 total score, $t(25.230) = 0.276$, $p = .785$, 95% confidence interval [– 6.944, 5.304]. There was no significant association between participant institution and whether participant data were retained or excluded, χ^2 (1) = 1.926, $p = .165$.

SD_{age} = 2.46, range 18–40 years; 79.7% Euro-Canadian).[6] The sample's mean ASI-3 total score was 21.57 (*SD* = 13.09), which is higher than typical nonclinical undergraduate samples (e.g., *M* = 16.74; Ebesutani et al., 2013; *M* = 12.8; Taylor et al., 2007),[7] but well below clinical samples of similar age and geographic region (e.g., *M* = 38.9; Olthuis, Watt, & Stewart, 2014), and a normed clinical sample (*M* = 32.6; Taylor et al., 2007).

Measures

Anxiety Sensitivity Index-3

The ASI-3 (Taylor et al., 2007) is an 18-item self-report measure of AS. Participants indicate the degree to which they agree with each item (e.g., "It scares me when my heart beats rapidly") on a 5-point scale (0 = *Very little*, 4 = *Very much*). The ASI-3 yields a total AS score and three AS dimensions: physical, cognitive, and social concerns. We used only the total score, which has been found to have good internal consistency, construct validity, and criterion-related validity (Reiss et al., 2008). Cronbach's alpha in the present study was excellent at 0.91.

Measures of reasons for music listening

Measures of reasons for music listening were selected based on quality (statistically validated), theoretical consistency (goal-oriented), consistency of content (measures of using music for emotion regulation among adolescents and young adults), and breadth of content (encompassed were motives for listening to music, emotion regulation, and musical reward experiences).

Motives for Listening to Music Questionnaire. The Motives for Listening to Music Questionnaire (MLMQ; (Kuntsche et al., 2015) is a 12-item self-report measure that assesses reasons for listening to music. Participants are presented with a list of reasons for listening to music (see Table I for example items) and indicate

[6] Three participants did not provide their age and were excluded from this calculation. To capture the typical variability in age of students attending university, including the small proportion that are mature students, no participants were excluded based on older age (e.g., if older than a typical undergraduate; i.e., >22 years).

[7] The normative sample was 66% women vs. 77.7% in the current sample. AS has been found to be elevated in women compared with men (e.g., Norr et al., 2015).

TABLE I.

Exploratory Factor Analysis of Three Music Function Measures: Factor Loadings and Communalities (h^2) for the Chosen Six-Factor Solution

Item	Original Scale/Item	Factor 1: Coping	Factor 2: Revitalization	Factor 3: Connection	Factor 4: Social Enhancement	Factor 5: Conformity	Factor 6: Sensory-Motor	h^2
1. When everything feels bad, helps bad feelings.	B-MMR13	0.861						0.615
2. When angry with someone, I listen to music.	B-MMR8	0.827						0.507
3. When distressed, music helps clarify feelings.	B-MMR19	0.751						0.655
4. When everything feels bad, music comforts me.	B-MMR7	0.724						0.710
5. Music is a way to forget about my worries.	B-MMR21	0.704						0.613
6. When I'm really angry, I like … angry music.	B-MMR15	0.693						0.360
7. To forget about your problems.	MLMQ7	0.632						0.519
8. Music has helped work through hard times.	B-MMR20	0.631						0.595
9. Music helps me understand different feelings.	B-MMR6	0.619						0.600
10. I listen to music to find solace when worried.	B-MMR18	0.598						0.663
11. Because it helps when depressed or anxious.	MLMQ10	0.572						0.552
12. When thoughts go round … get them off my mind.	B-MMR16	0.525	0.374					0.589
13. When I feel bad, I try a music-related activity.	B-MMR10	0.397						0.510
14. When I'm busy around house… background.	B-MMR2		0.725					0.441
15. I usually put background…more pleasant.	B-MMR5		0.723					0.476
16. In free time I hardly listen to music. (rev. scored)	BMRQ2		0.682					0.424
17. Music helps me chill out.	BMRQ14		0.636					0.526

Table I.

Continued

Item	Original Scale/Item	Factor 1: Coping	Factor 2: Revitalization	Factor 3: Connection	Factor 4: Social Enhancement	Factor 5: Conformity	Factor 6: Sensory-Motor	h^2
18. I listen to music make cleaning more pleasant.	B-MMR11		0.619					0.376
19. When exhausted, I listen to music to perk up.	B-MMR3		0.559					0.476
20. I listen to music to perk up after a rough day.	B-MMR12		0.558					0.616
21. Music comforts me.	BMRQ19		0.556					0.568
22. Music calms and relaxes me.	BMRQ9		0.540					0.473
23. I'm always looking for new music.	BMRQ11		0.500					0.306
24. When sad, listening to music comforts me.	B-MMR4	0.464	0.472					0.589
25. Music keeps me company when I'm alone.	BMRQ4		0.451					0.411
26 To cheer you up when you're in a bad mood.	MLMQ3		0.428					0.523
27. Because it is fun	MLMQ2		0.390					0.388
28. When tired out, I rest by listening to music.	B-MMR17		0.386					0.399
29. Because you like the feeling.	MLMQ6		0.370					0.443
30. When sharing music…I feel connected to others.	BMRQ1			0.647				0.409
31. Music has offered magnificent experiences.	B-MMR9			0.612				0.501
32. Music makes me bond with other people.	BMRQ6			0.567				0.425
33. Sometimes feel chills when I hear melody.	BMRQ18			0.552				0.359
34. I inform myself about music I like.	BMRQ7			0.523				0.332
35. I feel fantastic putting my soul into music.	B-MMR14			0.505				0.539
36. I like to listen to music that contains emotion.	BMRQ3			0.499				0.328

Table I.

Continued

Item	Original Scale/Item	Factor 1: Coping	Factor 2: Revitalization	Factor 3: Connection	Factor 4: Social Enhancement	Factor 5: Conformity	Factor 6: Sensory-Motor	h^2
37. I want to feel music in my whole body.	B-MMR1			0.486				0.354
38. At a concert I feel connected to … audience.	BMRQ16			0.479				0.345
39. I spend quite a bit of money on music.	BMRQ17			0.429				0.268
40. I get emotional listening to certain … music.	BMRQ8			0.428				0.332
41. I like to sing/play an instrument with others.	BMRQ13			0.416				0.217
42. I can cry when I listen to a melody I like.	BMRQ12			0.366				0.329
43. Because it helps you to enjoy a party.	MLMQ4				0.903			0.819
44. Because it improves parties and celebrations.	MLMQ1				0.862			0.728
45. Because it makes social gatherings more fun.	MLMQ9				0.739			0.735
46. So you won't feel left out.	MLMQ12					0.863		0.715
47. To fit in with a group you like.	MLMQ11					0.862		0.722
48. To be liked.	MLMQ8					0.739		0.577
49. Music often makes me dance.	BMRQ10						0.768	0.687
50. I don't dance, even to music I like. (rev. scored)	BMRQ5						0.656	0.419
51. Can't help humming/singing…to music I like.	BMRQ15						0.442	0.350
52. When I hear a tune, I like …moving to its beat.	BMRQ20						0.422	0.347
53. To get high.	MLMQ5							0.136
Cronbach's alpha coefficients		0.93	0.91	0.86	0.91	0.87	0.72	

Note. MLMQ = Motives for Listening to Music Questionnaire (Kuntsche et al., 2015); BMRQ = Barcelona Musical Reward Questionnaire (Mas-Herrero et al., 2013); B-MMR = Brief Music in Mood Regulation scale (Saarikallio, 2012). Factor loadings < 0.350 are not shown. Alphas were calculated across items showing salient, non-complex loadings on a given factor.

their frequency of listening to music for the specified reason on a 5-point scale (1 = *Almost never/Never*, 5 = *Almost always/Always*). The MLMQ has four subscales, each with three items: Social (rewards obtained by maintaining and strengthening personal relationships); Enhancement (rewards obtained through self-actualization, achieving, and optimizing positive moods and feelings); Coping (relief from daily stress, loneliness, tension/boredom, and negative feelings); and Conformity (relief from peer rejection fears by fitting in; social needs). This measure is based on the four-factor model of reasons for substance use (Cooper et al., 2016), which asserts that individuals are motivated by their desire to attain specific goals through their behavior. Four categories—Social, Enhancement, Coping, and Conformity motives—are derived from crossing two dimensions: reward versus relief, and internal versus external source of the desired change. The MLMQ scales have been found to have good internal reliabilities (Kuntsche et al., 2015).

Barcelona Musical Reward Questionnaire. The Barcelona Musical Reward Questionnaire (BMRQ; Mas-Herrero et al., 2013) is a 20-item measure of rewards and relief experienced from listening to music and participating in musical activities. Participants rate their level of agreement with a list of statements (see Table I for example items) using a 5-point scale (1 = *Completely disagree*, 5 = *Completely agree*). The BMRQ has five 4-item subscales: Musical Seeking (attending concerts, playing an instrument); Emotion Evocation (emotional impact); Mood Regulation (relieving stress, relief from negative emotions); Social Reward (social bonding); and Sensory-Motor (head nodding, dancing). BMRQ subscales have demonstrated good internal reliabilities (Mas-Herrero et al., 2013).

Brief Music in Mood Regulation Scale. The Brief Music in Mood Regulation Scale (B-MMR; Saarikallio, 2012) is a 21-item measure that assesses the use of seven different music-based emotion regulation strategies. Participants indicate their agreement with each statement using a 5-point scale (1 = *Strongly disagree*, 5 = *Strongly agree*). The B-MMR has seven 3-item subscales: Strong Sensation (emotional and attentional intensification); Entertainment (achieving and/or maintaining positive emotions); Revival (deriving energy from stress release); Solace (understanding, comfort); Mental Work (thinking about one's problems,

reappraising emotional challenges); Discharge (catharsis via music evincing emotions similar to those of the listener); and Diversion (forgetting negative affect). The B-MMR scales have been found to possess adequate internal consistencies (Saarikallio, 2012).

Procedure

Ethics approval was obtained at both universities. Prospective participants were informed that all data collected would remain anonymous and confidential, identified only by a randomly generated participant number, and that all data would be stored in a secure location accessible only to the study investigators. Participants completed questionnaires over 20–30 minutes via the online survey platform Fluid Surveys (now part of Survey Monkey) and received partial course credit as compensation.

Data cleaning and analytic strategy

Data were screened for outliers, linearity, normality, constant variability, and independence of observations. Analyses were conducted with SPSS 25. The EFA (N_{EFA} = 788) was computed using 53 items concerning reasons for using music across the three measures. Four strategies were used to determine the number of factors retained: Kaiser's eigenvalue-greater-than-one rule, Cattell's scree test, parallel analysis (mean and 95th percentile eigenvalues; Longman et al., 1989), and Velicer's minimum average partial test (Velicer et al., 2000). Effect size magnitude was estimated according to empirically developed guidelines (Gignac & Szodorai, 2016). These guidelines take into account the frequency of effect sizes found as a whole in psychological research focused on individual differences (e.g., involving personality traits such as AS). Gignac and Szodorai (2016) recommended correlations of 0.10, 0.20, and 0.30 be considered relatively small, typical, and relatively large in magnitude, respectively.

Results

Exploratory Factor Analysis

The Kaiser–Meyer–Olkin test statistic was 0.95, and Bartlett's test of sphericity was significant indicating that items from the three reasons for music listening measures were appropriate for

factor analyses. The factor extraction method used was principal axis factoring. As all items measured reasons for music listening and were thus assumed to be inter-correlated, the factors were obliquely rotated with Promax. The eigenvalues (and percent variance) for the first 10 consecutive components were 16.60 (31.31), 3.42 (6.45), 3.12 (5.89), 2.36 (4.46), 1.63 (3.08), 1.55 (2.92), 1.46 (2.76), 1.27 (2.40), 1.11 (2.10), and 1.00 (1.89), suggesting the extraction of 9 factors according to Kaiser's eigenvalue > 1.00 criterion. The scree test, however, suggested either two or five factors. Mean and 95th percentile eigenvalues both indicated an 8-factor solution was appropriate. By comparison, the number of components according to the revised minimum average partial test was six. Given the range of findings and the fact that the original measures had four (MLMQ), five (BMRQ), and seven (B-MMR) factors, solutions with these numbers plus six and eight factors were tested. The six-factor solution produced the simplest structure (i.e., the structure with the fewest complex and hyperplane loadings), the most readily interpretable solution, and was best aligned with the core reasons for music listening identified in the prior literature (e.g., Boer & Fischer, 2012; Lonsdale & North, 2011; Saarikallio & Erkkilä, 2007; Schäfer et al., 2013). Moreover, the six-factor solution adhered to the most stringent rule for factor extraction (the revised minimum average partial test). Table I presents the obliquely rotated factor loadings, communalities (h^2), and Cronbach's alpha coefficients for the six-factor lower-order solution. This solution accounted for 48.9% of the variance in reasons for music listening item scores. Salient loadings were evaluated as those ≥ 0.35. In the retained solution, each factor had sufficient items with non-complex, salient loadings. There were two complex items, that is, items with cross-loadings of ≥ 0.35 on more than one factor: specifically, B-MMR items 4 and 16. There was one hyperplane item, that is, with no salient loadings on any factor: specifically, MLMQ item 5. The two complex items and single hyperplane item were excluded from ensuing reliability analyses. Factor labels were assigned according to the common practice of examining the content of each factor's highest loading (i.e., most heavily weighted) items for common themes (Field, 2018), as follows: Factor 1: *Coping* pertained to listening to music to relieve feared arousal and negative affect (anger, anxiety, dysphoria, and stress); Factor 2: *Revitalization* reflected rewards gained from

TABLE II.

Bivariate Correlations Between Measures of Interest (N = 784)

Variable	1	2	3	4	5	6	7	8
1. F1 (Coping) factor scores	—							
2. F2 (Revitalization) factor scores	**.73**	—						
3. F3 (Connection) factor scores	**.66**	**.65**	—					
4. F4 (Social Enhancement) factor scores	**.21**	**.29**	**.17**	—				
5. F5 (Conformity) factor scores	**.29**	**.13**	**.16**	**.39**	—			
6. F6 (Sensory-Motor) factor scores	.08	**.30**	**.32**	**.31**	.03	—		
7. ASI-3 total score	**.22**	.09	**.17**	.06	**.16**	.08	—	—
8. Age in years	−.06	−.06	.02	**−.18**	**−.17**	−.02	−.04	
9. Gender	−.05	−.07	.03	−.01	−.01	**−.26**	**−.13**	−.01

Note. ASI-3 = Anxiety Sensitivity Index-3. Values in bold typeface were statistically significant at an alpha level of .0014 after Bonferroni correction (.05/36). Gender coding: "1" = woman; "2" = man.

listening to music to increase arousal, including for entertainment; Factor 3: *Connection* captured uses aimed at experiencing emotional connection with music itself and/or other people through shared musical experiences; Factor 4: *Social Enhancement* pertained to rewards gained from facilitating social engagement (improving parties); Factor 5: *Conformity* related to relief from fears of peer rejection; and Factor 6: *Sensory-Motor* related to embodied musical expression (dancing and singing). The six factors were sufficiently distinct, with the highest shared variance (51.55%) between the two emotional- and arousal-regulation factors: Coping (F1) and Revitalization (F2). Most loadings per factor were above 0.50 and average loadings per factor were 0.67, 0.54, 0.50, 0.87, 0.82, and 0.62, for Factors 1–6, respectively.

Bivariate Correlations

Bivariate correlations were calculated between participant age, gender, ASI-3 total scores, and the six core reasons for music listening factor scores,[8] derived using the regression method based

[8] Results of an alternate correlational analysis using subscale scores (where items with salient, non-complex loadings for each factor were summed) were not meaningfully different. Please see Supplementary Table 1.

on the earlier EFA. A stringent Bonferroni-adjusted alpha level correction was applied in evaluating the significance of the correlation coefficients (i.e., 0.05/28 = 0.0018; two-tailed tests). Results are presented in Table II. ASI-3 total scores correlated significantly and positively with Coping (F1), Connection (F3), and Conformity (F5) and not significantly with Revitalization (F2), Social Enhancement (F4), or Sensory-Motor (F6) reasons for music listening. Participant age correlated significantly and negatively with Social Enhancement (F4) and Conformity (F5). Participant age and ASI-3 total scores were not significantly correlated. Participant gender correlated significantly and negatively with Sensory-Motor (F6) and ASI-3 total scores, indicating women (vs. men) had higher scores on both variables.

Hierarchical Multiple Regression Analyses

A hierarchical regression approach was used to determine whether ASI-3 total scores would explain each core reason for music listening over and above the known effects of age and gender. Accordingly, for each analysis, at Step 1, participant age and gender were entered. At Step 2, participant age, gender, and ASI-3 total score were entered. One of the core reasons for music listening factor scores[9] served as the criterion variable in each successive regression analysis. Results are presented in Table III. ASI-3 total scores significantly and incrementally explained Coping (F1), Connection (F3), and Conformity (F5) factor scores over and above the effects of age and gender. While holding ASI-3 total score and gender constant, increasing age significantly explained lower Social Enhancement (F4) and Conformity (F5) factor scores. While holding ASI-3 total score and age constant, being a man (vs. a woman) significantly explained lower Sensory-Motor (F6) factor scores. Neither age and gender nor ASI-3 total scores explained Revitalization (F2) factor scores. The partial correlations found in Table III were used to provide effect size magnitude estimations. The effect of AS level (i.e., ASI-3 total scores) on Coping (F1) factor scores was typical; on Connection (F3) factor scores, relatively small to typical; and on Conformity (F5) factor scores, relatively small (Gignac & Szodorai, 2016).

[9] Results of an alternate hierarchical multiple regression analysis using subscale scores (where items with salient, non-complex loadings for each factor were summed) were not meaningfully different. Please see Supplementary Table 2.

TABLE III.

Age in Years and Anxiety Sensitivity as Predictors of Music Function Factor Scores

Dependent Variable	Predictor	*B*	*SE B*	95% CI for *B* Lower	95% CI for *B* Upper	β	*p*	*pr*	R^2	ΔR^2
F1 (Coping) factor score	Step 1								.006	
	Constant	.535	.268	.009	1.062		.046			
	Age in years	−.021	.013	−.046	.004	−.058	.105	−.058		
	Gender	−.115	.084	−.279	.050	−.049	.173	−.048		
	Step 2								.052	.047*
	Constant	.038	.274	−.500	.576		.890			
	Age in years	−.017	.013	−.042	.007	−.048	.166	−.050		
	Gender	−.048	.083	−.210	.115	−.020	.564	−.021		
	ASI-3 total score	**.016**	**.003**	**.011**	**.021**	**.218**	**<.001**	**.217**		
F2 (Revitalization) factor score	Step 1								.009	
	Constant	.640	.265	.120	1.160		.016			
	Age in years	−.023	.013	−.048	.002	−.064	.071	−.065		
	Gender	−.168	.083	−.330	−.005	−.072	.043	−.072		
	Step 2								.015	.005
	Constant	.472	.276	−.070	1.015		.088			
	Age in years	−.022	.013	−.047	.003	−.061	.086	−.061		
	Gender	−.145	.083	−.309	.019	−.062	.082	−.062		
	ASI-3 total score	.005	.003	.000	.011	.074	.038	.074		

Table III.

Continued

Dependent Variable	Predictor	*B*	*SE B*	95% CI for *B* Lower	95% CI for *B* Upper	β	*p*	*pr*	R^2	ΔR^2
F3 (Connection) factor score	Step 1								.001	
	Constant	−.189	.260	−.699	.321		.467			
	Age in years	.006	.012	−.018	.031	.018	.615	.018		
	Gender	.057	.081	−.103	.216	.025	.485	.025		
	Step 2								.032	.031*
	Constant	−.577	.268	−1.102	−.052		.031			
	Age in years	.009	.012	−.015	.033	.026	.465	.026		
	Gender	.109	.081	−.050	.267	.048	.178	.048		
	ASI-3 total score	**.013**	**.003**	**.008**	**.018**	**.176**	**<.001**	**.175**		
F4 (Social Enhancement) factor score	Step 1								.029	
	Constant	1.183	.259	.675	1.691		<.001			
	Age in years	**−.060**	**.012**	−.084	**−.035**	**−.170**	**<.001**	**−.170**		
	Gender	−.030	.081	−.189	.129	−.013	.710	−.013		
	Step 2								.032	.002
	Constant	1.071	.270	.541	1.602		<.001			
	Age in years	**−.059**	**.012**	**−.083**	**−.035**	**−.168**	**<.001**	**−.168**		
	Gender	−.015	.082	−.175	.145	−.007	.854	−.007		
	ASI-3 total score	.004	.003	−.001	.009	.050	.157	.051		

TABLE III.

Continued

Dependent Variable	Predictor	*B*	*SE B*	95% CI for *B* Lower	95% CI for *B* Upper	β	*p*	*pr*	R^2	ΔR^2
F5 (Conformity) factor score	Step 1								.028	
	Constant	1.130	.254	.630	1.629		<.001			
	Age in years	**–.057**	**.012**	**–.081**	**–.033**	**–.166**	**<.001**	**–.166**		
	Gender	–.030	.080	–.186	.126	–.013	.705	–.014		
	Step 2								.050	.023*
	Constant	.798	.263	.281	1.314		.003			
	Age in years	**–.055**	**.012**	**–.078**	**–.031**	**–.159**	**<.001**	**–.161**		
	Gender	.014	.079	–.141	.170	.006	.856	.007		
	ASI-3 total score	**.011**	**.003**	**.006**	**.016**	**.152**	**<.001**	**.153**		
F6 (Sensory-Motor) factor score	Step 1								.069	
	Constant	.852	.239	.383	1.320		<.001			
	Age in years	–.008	.011	–.031	.014	–.025	.461	–.026		
	Gender	**–.566**	**.075**	**–.712**	**–.419**	**–.262**	**<.001**	**–.262**		
	Step 2								.071	.002
	Constant	.755	.249	.265	1.245		.003			
	Age in years	–.008	.011	–.030	.015	–.023	.498	–.024		
	Gender	**–.553**	**.075**	**–.700**	**–.405**	**–.256**	**<.001**	**–.254**		
	ASI-3 total score	.003	.002	–.002	.008	.046	.186	.047		

Note. pr = partial correlation, defined as the correlation between an independent variable and a dependent variable after controlling for the influence of other variables on both the independent and dependent variables. Variables in bold typeface were statistically significant at an alpha level of .008 after Bonferroni correction (.05/6).

*Denotes where AS provides significant incremental variance above age and gender in predicting the specified music listening function factor scores. Gender coding: "1" = woman; "2" = man.

Discussion

The goals of the present study were to clarify the core reasons for music listening in university students and to examine connections between AS (i.e., fear of arousal-related sensations) and these core reasons for music listening. We predicted that higher (vs. lower) AS would be associated with listening to music for relief from negative emotions (e.g., coping and conformity) and would not be associated with listening to music for rewards (e.g., for arousal/emotional or social enhancement). Six core reasons for music listening were identified among 53 reasons for using music contained in three previously validated measures (Kuntsche et al., 2015; Mas-Herrero et al., 2013; Saarikallio, 2012): *Coping*: listening to relieve negative emotions through distraction, emotional catharsis (lowering arousal/negative states); *Conformity*: listening to relieve fears of peer rejection (lowering arousal/negative states); *Revitalization*: listening to obtain rewards such as increased energy/vitality or for entertainment (increasing arousal/positive states); *Social Enhancement*: listening for social rewards such as rendering a social gathering more engaging (increasing positive emotions and social relationships); *Connection:* building emotional connections to music and/or others through music listening; and *Sensory-Motor*: embodied musical expression (singing or dancing) while listening to music. Coping and Revitalization accounted for most of the variance, highlighting the importance of emotion regulation (decreasing undesirable states and increasing desirable states) as a primary reason for listening to music overall.

The results of the present EFA align with previous investigations of reasons for music listening among young adults. Lonsdale and North's (2011; studies 2 and 3) sample of undergraduates emphasized (1) Coping (listening to music to relieve anxious arousal and negative emotions through distraction or emotional catharsis, and to facilitate reflection); (2) Conformity (listening to music to relieve fears of in-group rejection); (3) Revitalization (listening to music for rewards such as increased energy and as background entertainment); (4) Social Enhancement (listening to music to make group activities more enjoyable/rewarding); (5) Connection (intensification of emotions, to connect and bond with others); and (6) Sensory-Motor (singing or dancing to music). All of these reasons for listening to music were captured by the measures analyzed in

the current study and align with the factors obtained in our analysis. Furthermore, each measure incorporated goal-motivated theoretical explanations for why young adults incorporate music listening into their lives. Firstly, in developing the rationale for constructing the B-MMR, Saarikallio (2012) noted many musical activities are goal-oriented (e.g., aimed at the personal goal of regulating mood and arousal). Secondly, the MLMQ (Kuntsche et al., 2015) was based on the four-factor model of reasons for substance use (Cooper et al., 2016) which asserts that individuals are motivated by their desire to attain specific goals through their behavior. Lastly, the BMRQ (Mas-Herrero et al., 2013) measures the relief and rewards (i.e., attained goals) of listening to and participating in music. Thus, the six-factor structure identified in the current study appears to be a comprehensive and parsimonious account of reasons for music listening in university students.

Relationships between AS and the six core reasons for music listening were examined next. Given that individuals with higher AS are inclined to prevent, avoid, or escape feared arousal symptoms that result from negative emotions (Allan et al., 2015; Sabourin et al., 2011; Taylor et al., 2007), it was predicted that AS levels would be associated with reasons for music listening involving a desire for relief from negative emotions (e.g., Coping and Conformity). It was also predicted that AS levels would be unrelated to reasons for music listening that provide rewards such as mood or social enhancement—reasons that involve facilitating increases in positive emotions and social connections. Our results largely confirmed these predictions. AS was positively correlated with both Coping and Conformity reasons for music listening, in which music may facilitate relief from undesirable arousal due to negative emotions or fears of peer rejection, respectively. Also as predicted, AS was unrelated to Revitalization and Social Enhancement reasons for music listening, in which emotional rewards are gained from music listening, such as increased energy, enhanced positive emotions, and greater group enjoyment of social activities, respectively.

These four core reasons for music listening (Coping, Conformity, Revitalization, and Social Enhancement) mapped quite closely onto the four-factor model of reasons for substance use (i.e., coping with negatively valent emotions, social conformity, enhancement of positive mood or well-being, and social enhancement), consistent with Cooper et al.'s (2016) framework and extending it

beyond substance use (see also Kuntsche et al., 2015). Many items concerning the regulation of negative emotional states loaded on the Coping factor (e.g., "When everything feels bad, it helps me to listen to music that expresses my bad feelings"). Interestingly, no items directly referenced relief from undesirable physiological arousal. For people with higher AS, however, relief from undesirable internal states is not limited to symptoms of physiological arousal alone. Music listening for coping reasons (like use of arousal-dampening substances) appears to be engaged as a means of relieving negatively valent emotional states, which are stressors and, therefore, drivers of concerning arousal symptoms for individuals with higher AS (e.g., Jonker & Kuntsche, 2014; Lonsdale & North, 2011; Saarikallio & Erkkila, 2007). Future research could benefit, however, from the inclusion of items that make direct reference to physiological arousal symptoms in addition to descriptions of negative emotional states that drive such symptoms.

Notably, the Revitalization factor subsumed items pertaining to both increases (e.g., "I listen to music to perk up when exhausted/after a rough day") and decreases (e.g., "Music calms and relaxes me") in arousal (see Table I). For some people, it is conceivable that listening to slow-paced music to "chill out" or "relax" is akin to "perking up" or the subjective experience of revitalization. For others, it could be that revitalizing oneself via exciting, fast-paced music listening constitutes "chilling out"—a sentiment perhaps familiar to anyone who has felt a desire to "relax and party." In future work, revitalization via listening to arousal-reducing music versus arousal-increasing music could be teased apart by administering questionnaire items suited to distinguishing between these two forms of revitalization.

Also explored was whether AS would statistically account for participant factor scores on each core reason for music listening that emerged, over and above the known effects of age and gender. AS accounted for Coping and Conformity (both relief-oriented) but not Revitalization or Social Enhancement (both reward-oriented). These results mirrored the hypothesized correlations and aligned with the four-factor motivational model of substance use (Cooper et al., 2016; Kuntsche et al., 2015).

Interestingly, AS also correlated positively with Connection reasons for music listening, over and above age and gender. Connection lies outside the four-factor conceptualization of music

motives (Kuntsche et al., 2015). Those with higher AS may find, in music listening, relief from the social disconnection characteristic of social anxiety and low mood, and the emotional dysregulation symptoms associated with higher AS (e.g., Noël et al., 2013). This conceptualization would place Connection in a class of relief-oriented reasons for listening akin to Coping and Conformity.

AS levels were uncorrelated with listening to music to dance or sing along (Sensory-Motor). This core reason for music listening also lies outside of the four-factor conceptualization of music listening motives (Kuntsche et al., 2015) and may, therefore, represent a music-specific reward activity, like other reasons for listening to music that offer rewards such as energy/vitality (Revitalization) and heightened enjoyment of group activities (Social Enhancement).

AS had a moderate (Coping) to relatively small (Conformity) ability to statistically account for reasons for listening to music to relieve undesirable emotional states or to relieve fears of peer rejection, respectively. Notably, however, similar findings were obtained across both of these core reasons for music listening. This convergence of results supports the notion of a broadly applicable tendency for individuals with higher AS to seek out multiple methods of relief from undesirable emotions, such as through prevention, avoidance, and escape behaviors (e.g., Allan et al., 2015). Furthermore, the current findings bring a new area of emotion regulatory behavior (i.e., music listening) into alignment with previous findings concerning (1) the tendency of people with higher AS to take action to relieve aversive emotions (e.g., Allan et al., 2015; Taylor et al., 2007) and (2) the motivational structure that drives such behaviors (Cooper et al., 2016).

Increasing age statistically accounted for declining use of music listening for Social Enhancement and Conformity reasons. Despite the importance of these reasons for listening to music in adolescence and young adulthood (e.g., Saarikallio, 2010; Saarikallio & Erkkilä, 2007), the current results support and extend cross-sectional evidence of a shift away from social reward and social relief-oriented music listening with increasing age. Lonsdale and North (2011) found that, from as young as age 30, music becomes significantly less personally important and it commands less time and money relative to young adulthood. We did not observe, however, the age-related decline in music listening

for emotion regulation purposes (i.e., Coping) suggested by some previous work (e.g., Groarke & Hogan, 2016; Lonsdale & North, 2011). The size of the age-related decline in listening to regulate emotions may, therefore, be considerably smaller than age-related declines in using music listening for social enhancement and social conformity. Most participants in the current study were aged 18–22 years, however, which may have precluded observation of an association between age and music listening for Coping reasons. Given the narrow age range of the current sample, the age-related findings above should be interpreted with caution.

Gender statistically accounted for Sensory-Motor factor scores, with lower scores in men compared with women. This suggests that among university undergraduates, men may be less inclined than women to enhance music listening experiences with humming, singing, dancing, or other movements. This finding aligns with those of Mas-Herrero et al. (2013). By contrast, this study found no additional support for greater endorsement of using music listening to regulate emotion (including arousal) among young adult women as compared with men (Groarke & Hogan, 2018; Lonsdale & North, 2011; Mas-Herrero et al., 2013). Other studies have also failed to find this gender difference (e.g., Saarikallio, 2012; Saarikallio et al., 2012; Schäfer et al., 2013). Small differences between samples in participant ages may account for these inconsistencies, as gender differences in music listening for emotion regulation have been found to wax and wane during the transition from adolescence to young adulthood (Saarikallio, 2012). Future work might include a variety of measures that examine reasons for music listening, across a wide range of ages, to resolve divergent gender-related findings.

The ways individuals with higher AS use music may differ according to individual mental health profiles. Higher AS has been linked to a broad range of disorders, such as panic, generalized anxiety, social anxiety, and depression (Baek et al., 2019; Naragon-Gainey, 2010; Taylor, 1999). Listening to music for reasons of relief from negative emotions through discharge or distraction has been linked to elevated anxiety, depression, and stress (Thomson et al., 2014). Listening to music for coping and conformity reasons also has been linked to diminished health and well-being (Jonker & Kuntsche, 2014). As the current results allow the possibility that

people with higher AS listen to music to cope with negative emotions and to fit in with (i.e., conform to) others, future research should explore (via longitudinal mediation analyses) whether AS may lead to listening for relief-oriented prevention, avoidance, or escape from undesirable emotional states (e.g., Allan et al., 2015). Additionally, to address questions of causality, experimental designs should be developed that probe whether active symptoms of higher AS promote listening for relief from negative affect (coping) and to relieve fears of peer rejection (conformity). Future research also could investigate whether those with higher AS listen to varying types or genres of music for different reasons (e.g., Cook et al., 2019). Some characteristics of music appear to enhance emotion regulation (e.g., consonance), whereas other characteristics seem to do the opposite (e.g., harmonic complexity) and may be less helpful to certain clients (Moore, 2013). Similarly, greater musical intensity (i.e., loudness) and faster speed increase tense arousal (tension vs. relaxation), whereas less intense and/or slower music reduces tense arousal (Ilie & Thompson, 2011). Additionally, the musical components (e.g., textural complexity, mode, pitch level and/or range) that may differentiate music chosen for varying reasons should be investigated.

The current findings align with the literature on AS and substance use. Individuals with higher AS avoid using arousal-activating substances (e.g., marijuana, nicotine) in favor of arousal-dampening substances (e.g., heroin, alcohol, benzodiazepines) to relieve (i.e., reduce or avoid) the negative affect triggered by feared arousal sensations; they also use arousal-dampening substances to manage their fears of peer rejection (i.e., to conform; Lejuez et al., 2006; Woicik et al., 2009). Using substances to avoid thinking about a problem or to avoid feeling discomfort could preclude the development of coping strategies that are more beneficial in the longer term (e.g., Kuntsche et al., 2015). These insights from the substance use literature could inform understanding of how and why listening to music induces desired emotional changes for clients with higher AS. Some research (e.g., Saarikallio & Erkkilä, 2007) sees "mood regulation by music as a process of satisfying personal mood-related goals" (p. 88). If music therapists assume, however, that all clients select music that works effectively for regulating their emotions, therapists may miss clients (e.g., those with higher

AS) for whom immediate relief from negative emotions comes with long-term consequences. Should additional research determine that listening to music for short-term relief from negative emotions or fears of peer rejection constitutes an avoidance-oriented emotion regulation strategy (e.g., Kuntsche et al., 2015; Thomson et al., 2014), careful assessment of client reasons for listening to music could equip music therapists to optimize individualized plans for achieving both short- and long-term therapeutic as well as personal goals (Moore, 2013; see also Hanson-Abromeit, 2015). If a client with higher AS is found, for example, to be relying heavily on music for short-term relief from negative emotions (Coping), the therapist could guide a broadening of their reasons for listening to music. Those with higher AS may also benefit from combining music listening with evidence-based emotion regulation and cognitive processing strategies that facilitate engagement with, rather than avoidance of, arousal-inducing thoughts and emotions (e.g., Olthuis, Watt, Mackinnon, et al., 2014) such as cognitive reappraisal (Chin & Rickard, 2012). Furthermore, skill-building in listening for revitalization and social enhancement (Thomson et al., 2014) may be more beneficial and less problematic in the long term compared with listening to cope or to conform.

The following limitations should inform consideration of the current results. Self-report measures may be limited by current and retrospective biases. This research was cross-sectional in nature and, therefore, does not allow for firm conclusions regarding directionality or causality of effects. The factor scores used in the hierarchical regression analyses were empirically (vs. theoretically) derived and are, therefore, not pure measures of the constructs in question. Although considerable evidence supports the distinctiveness of AS from trait anxiety (Reiss, 1991; Zavos et al., 2012), the current study included no measurement and control of trait anxiety to assess whether the current findings are unique to AS. The generalizability of the present study may be limited; future studies would benefit from a sample with greater diversity in gender, age, and cultural background in exploring the core reasons for music listening and their relations to individual differences like AS.

In conclusion, the results of the present study support the four-factor model of reasons for music listening (Cooper et al., 2016; Kuntsche et al., 2015), while presenting evidence for a statistical

association between AS and using music listening for reasons involving relief from negative emotions (through coping or distraction) and relief from fears of peer rejection (social conformity). People with higher (vs. lower) AS may make greater use of music listening to prevent, escape, or avoid aversive emotional states, but additional longitudinal and experimental research is needed to determine directionality and causality, respectively. Results also revealed an interesting association between AS and listening to music to build emotional connections to music and/or to others (Connection) which requires further study. These findings may guide researchers in their investigations of the benefits and drawbacks of various reasons for music listening and may lead to improvements in how music therapists tailor treatment for individuals at risk for anxiety and related mental health problems.

Supplementary Material

Supplementary material is available online at *Journal of Music Therapy*.

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