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The effects of music induction on mood and affect in an Asian context

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Abstract

A sample of Asian participants was assessed using the Brunel Mood Scale and the Positive & Negative Affect Scale before and after music mood induction procedures to which each participant was randomly assigned. A series of mixed analyses of variance with the type of music (happy/positive vs. sad/negative) as the between-subject factor and pre–post music exposure as the within-subject factor revealed that the sad music induction attenuated the positive moods Vigor and Happiness, as well as the negative moods Anger, Tension, Fatigue, and Confusion but had no significant impact on Depression or Calmness, casting doubt on the robustness of Thayer's circumplex model of mood formation. The happy music induction increased Vigor and decreased Fatigue and Confusion, suggesting that positive music has the potential to lift energy levels. The happy music induction led to increases in Positive Affect only, whereas the sad music condition attenuated both Positive Affect and Negative affect, casting doubt on Watson and Tellegen's contention that the Affect systems are independent and suggesting that the bipolarity hypothesis may not provide a comprehensive explanation of mood formation. The mechanisms by which music may impact mood and potential differences in the expression of affect between Asian and Western participants are discussed.

Keywords

music mood induction, circumplex model of mood, Positive Affect, Negative Affect, bipolarity hypothesis of mood, BRUMS

Music is a ubiquitous phenomenon across human cultures and is often regarded as the universal language of emotions that is commonly used to change and to maintain affective states (Juslin & Sloboda, 2011; Schäfer, Sedlmeier, Städtler, & Huron, 2013; Van den Tol & Edwards, 2015). Researchers have explored many effects of music on emotions and cognition including music-creativity relationships (He, Wong, & Hui, 2017), music and pain relief (Dunbar,

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Kaskatis, MacDonald, & Barra, 2012; Lee, 2016; Lim & Locsin, 2006), impact of music on cognitive task performance (Schellengerg, Nakata, Hunter, & Tamoto, 2007), and how music affects memory (Nguyen & Grahn, 2017). However, the major area of research is the management of moods and emotions (Hanser, ter Bogt, Van den Tol, Mark, & Vingerhoets, 2016; Peltola & Eerola, 2016) because moods and emotions are essential components of everyday life that can have a significant influence on many aspects of psychological well-being and cognitive functioning (Mitchell & Phillips, 2007). Although there are some features of music that appear to be universal across different cultures, it is also clear that the responses to music are based on cultural and social factors (Hannon & Trainor, 2007; Morrison & Demorest, 2009; Russo & Ammirante, 2018) that may lead to differences in emotional reactions to music (Balkwill & Thompson, 1999; Juslin, Barradas, Ovsiannikow, Limmo, & Thompson, 2016). However, it is not yet clear to what extent moods and emotions may or may not be evoked by the universal or by the specific cultural features of music (Swaminathan & Schellenberg, 2015), and as most research to date has been conducted on participants from Western cultures (Morrison & Demorest, 2009), more research on non-Western cultures is needed to help resolve this question.

Models of affective states

Emotions are generally defined as short-lived situational reactions to some meaningful event, whereas moods are low intensity, subjective feelings that are relatively long in duration. Affect is commonly described as an "umbrella" concept for both moods and emotions, and has positive and negative valence based on the cognitive appraisal of situations (Juslin & Sloboda, 2011; Van den Tol & Edwards, 2011). The structure of emotions is well-defined and includes bodily arousal, subjective experience, and expressions (Scherer, 2005), whereas the processes underlying moods and mood changes are not yet clear. However, several theorists have argued that moods are essentially binary or bipolar with positive moods being the opposite of negative moods along a single dimension. Thayer (2012) proposed that moods can be localized in a space bounded by two axes, the first a tiredness and energy spectrum and the second, a calmness and tension continuum, emphasizing that the regulation of energy levels and tension are common features of mood changing strategies. Watson and Tellegen (1985) propose a similar two-dimensional structure of moods based on the underlying and independent systems of Positive Affect (PA) and Negative Affect (NA). PA is the state of pleasurable engagement that motivates approach behavior, while NA is unpleasant, an aversive motivational system that promotes withdrawal behavior (Watson, Wiese, Vaidya, & Tellegen, 1999). This "bivalence" hypothesis proposes that PA and NA are mutually exclusive such that high levels of PA are not associated with a corresponding low level of NA. Thus, for instance, a person could have both high NA and high PA when taking on a pleasant yet anxiety-provoking task such as speaking in public (Niles, Craske, Lieberman, & Hur, 2015).

Music and mood regulation

It seems obvious that happy music should make us happier whereas sad music should evoke sad moods, yet research has shown that this view is too simplistic (Kawakami, Furukawa, Katahira, & Okanoya, 2013). Happy mood induction generally has a positive effect on mood and leads to an increase in pleasant affective states (Cassidy & MacDonald, 2010; Cheng, Jiao, Luo, & Cui, 2017; Harkness, Jacobson, Duong, & Sabbagh, 2010; Van Der Zwaag et al., 2012); however,

sad mood induction can have a variety of different effects. Van den Tol and Edwards (2011) investigated why people select sad music when experiencing negative events and found that sad music triggers memories that help to connect with the current affective state and make it easier for people to express their feelings in ways that may eventually lead to mood enhancement. This emotional impact of listening to sad music could be dependent on valence and arousal, and Peltola and Eerola (2016) highlighted three themes in experiencing affective states while listening to sad music: high arousal and negative valence were linked to grief, low arousal and negative valence were labeled melancholia, and positive valence was called "sweet sorrow." Thus, music mood induction can produce a variety of effects that may or may not correspond with the type of music; however, the precise nature of this relationship and its generalizability across cultures clearly requires further exploration.

Empathetic responses to acoustic characteristics of sad music as well as learned associations could also explain the variety of responses to sad music (Huron, 2011; Yoon, Verona, Schlauch, Schneider, & Rottenberg, 2019). Contextual aspects like culture or social settings appear to moderate the effects of listening to sad music and these factors may impact on affect regulation process thus leading to mixed emotions. Evidence from fMRI scans suggests that the complexity of responses to sad music may be explained by functional connectivity in up to five different brain network systems (Harrison et al., 2008). Huron (2011) suggested that levels of prolactin can impact how listeners perceive sad music, with higher prolactin levels being associated with more pleasurable experiences of music-evoked sadness. However, the empirical findings made to date do not yet provide a conclusive explanation of the mechanisms by which sad music influences cognitions and emotions or why music listening remains such a significant source of consolation compared with other soothing behaviors (Hanser et al., 2016).

It has also been shown that the acoustic features of music can produce confusion in affective responses: fast tempo music in a major key is usually perceived as being happier whereas slow tempo music in a minor key sounds sadder (Hunter, Schellenberg, & Griffith, 2011). If a song varies in tempo and key unexpectedly, it can evoke mixed feelings because of confusing cues (Swaminathan & Schellenberg, 2015). Larsen and Stastny (2011) conducted an experiment with consistent (i.e., fast tempo and major keys) and inconsistent (i.e., fast tempo in minor keys) music and found that participants pressed both "happy" and "sad" buttons simultaneously when listening to music with conflicting cues. This may indicate that happy and sad affective states can be experienced at the same time which implies that they are functions of independent brain systems (Larsen & McGraw, 2011).

Music may influence an individual's mood even without the individual being consciously aware of its effects. Cardiovascular measures taken to evaluate the emotional states of individuals after music has been used as a negative mood induction procedure have shown that low arousal music of any valence reduces systolic reactivity even if participants are unaware of the music having had any effect (Fairclough, van der Zwaag, Spiridon, & Westerink, 2014). Linnemann, Ditzen, Strahler, Doerr, and Nater (2015) recorded participants' stress levels using objective measures of cortisol and alpha-amylase in saliva samples along with participants' subjective ratings of stress to explore the potential stress-reducing effect of listening to music. The results showed that listening to any music reduced subjective stress levels. When "relaxation" was the reason given for listening to music, subjective stress levels significantly decreased as did levels of cortisol. Conversely, levels of alpha-amylase varied as a function of music type, with energizing music increasing and relaxing music decreasing levels of the hormone.

Cultural differences in music perception

As already mentioned, cultural factors may influence the ways individuals experience, express, and interpret their affective states (Peltola & Eerola, 2016; Sachs, Damasio, & Habibi, 2015; Swaminathan & Schellenberg, 2015), and cultural background can also impact music perception and affective reactions to different types of music (Eerola, Himberg, Toiviainen, & Louhivuori, 2006; Gregory & Varney, 1996). Although the bulk of music and mood studies have been conducted in Western countries, there is a nascent interest in such research in the Asian context (Hu & Lee, 2012; Nettamo, Nirhamo, & Häkkilä, 2006; Tolos, Tato, & Kemp, 2005).

Hu and Lee (2012) studied the difference in music mood perception between American and Chinese participants, and found that there was a significant difference in mood judgments. Chinese participants more often judged music pieces as rousing, boisterous, and passionate; this may have been because the Chinese culture does not promote the open expression of emotions and thus encourages low arousal emotions, meaning that Chinese participants tended to interpret music as more energetic than their Western counterparts who generally experience higher arousal emotional states (Lim, 2016). Similarly, Tolos et al. (2005) found that Asian participants found pop music more aggressive than Westerners. Argstatter (2016) conducted cross-cultural research on perceptions of the basic emotions expressed in music across four countries: Germany, Norway, South Korea, and Indonesia. He found that happiness and sadness were the most distinctly identified emotions across all cultures, but that Western music intended to express surprise, disgust, fear, and anger produced a lot of confusion among Asians. It seems obvious that culturally familiar musical stimuli are more easily recognized and likely to be most emotionally evocative but bilingual individuals may be better at making some musical distinctions (Milovanov, Huotilainen, Välimäki, Esquef, & Tervaniemi, 2008). However, it may also be possible for individuals to become what Wong, Roy, and Margulis (2009) have termed "bimusical," that is capable of responding to music from different cultures as though they were native listeners from both.

The present study

The present study aimed to provide a greater understanding of affective processes by measuring PA, NA, and discrete moods resulting from mood induction through music in an Asian context. The present research was conducted in Singapore, a South East Asian country which has three major ethnic groups: Chinese, Malay, and Indian. Children from each ethnic group undertake some education in their own native tongue and in many cases speak this language at home, yet all Singaporeans are educated in the official language, English, which is also the language of government and administration (Wee, 2003). This means that although most Singaporeans are familiar with their own Asian culture, most are to some extent bilingual and familiar with Western, specifically British culture. This combination of cross-cultural influences provides an interesting opportunity to explore the extent to which music mood induction may impact affective states and moods through universal or culturally specific features. Based on the previous research discussed above, it was anticipated that the music mood induction procedure (MMIP) would lead to changes in PA and NA via interactions between the type of music (happy or sad) and initial affective states of the participants. Specifically, it was hypothesized that, contrary to the two-dimensional structure of moods proposed by Watson and Tellegen (1985) yet in line with Thayer's binary model, sad music would lead to an increase in negative moods and affect, with a corresponding decrease in positive moods and affect, whereas happy music would lead to increased positive moods and affect, with a concomitant reduction in negative moods and affect.

Method

Design and variables

This study used a two-factorial experimental design with music as the between-subject factor with two levels—happy and sad music, and pre- and post-mood measurements as the within-subject factor. The dependent variables were (1) eight types of moods and (2) PA and NA.

The first dependent variable was operationalized through measurements of discrete moods using the 32-item Brunel Mood Scale (BRUMS; Lane & Jarrett, 2005), which contains eight subscales, each with four items, to measure the following moods: Anger, Tension, Depression, Vigor, Fatigue, Confusion, Happy, and Calmness. Participants complete BRUMS by rating their current feelings on 32 adjectives using a Likert-type scale from 0 (*not at all*) to 4 (*extremely*).

PA and NA were measured using the 20-item Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), which assesses two independent types of affect using a 5-point Likert-type scale from 1 (*not at all*) to 5 (*extremely*).

The MMIP for inducing the desired affective states followed the generally accepted protocol (e.g., Gilet, 2008; Västfjäll, 2002). Participants completed the questionnaires before and after the MMIP to yield pre- and post-induction scores for measuring the effects of music on their emotions and affective states. The study was conducted in controlled conditions whereby participants sat at individual desks to ensure the privacy of their answers, and to avoid any peer pressure or social desirability effects. All participants were undertaking Diploma or Degree courses with English as the instructional medium and that required an entry exam to establish English proficiency. Therefore, all materials were used without translation as all participants had proficient English-speaking skills.

Participants

There were 106 participants in the study (56 males) aged between 18 and 36 years old ($M = 22.03$, $SD = 4.71$) who were recruited face-to-face on a college campus in Singapore. The participants were randomly assigned to the positive MMIP (52 participants, 26 females, aged 18–34 [$M = 23.56$, $SD = 5.05$]) or negative MMIP (54 participants, 24 females, aged 18–36 [$M = 20.56$, $SD = 3.85$]) conditions.

Procedure and materials

The song for the positive MMIP was "Eye of the Tiger" by Survivor, which was ranked fifth in a list of top "all time feel good songs" (Woollaston, 2015). The song for the negative MMIP was "Everybody Hurts" by REM, which was ranked as the most depressing song (King, 2012). To ensure that the selected songs were appropriate stimuli for mood induction, they were analyzed by professional musicians using Bruner's table of musical elements and emotional expression of music (Västfjäll, 2002). In these typologies, the happy/sad songs should have the following musical elements: major/minor mode, fast/slow tempo, high/low pitch, and uneven/even rhythm. The professional musicians reported that both tracks met most of these criteria, but also made use of changes between major and minor keys to emphasise the emotional significance of the songs. Thus, "Eye of the Tiger" is in minor key with the repeated chorus in a major key and "Everybody Hurts" is in major key with the choruses played in a minor key, and both songs use lyrics to accentuate the happy and sad emotional effects of the music (Västfjäll, 2002).

The songs by prominent Western popular musicians were chosen for mood induction because, despite the fact that the Singaporean population is overwhelmingly of Asian ethnicity

Table 1. The main effects (pre- and post-induction) for the mixed ANOVA on the BRUMS.

	Before		After	
	M	*SD*	*M*	*SD*
Anger	3.32	3.76	2.86	3.76
Tension	3.76	3.60	3.25	3.82
Depression	3.98	3.95	3.57	3.90
Vigor	6.68	3.65	7.33	4.33
Fatigue	7.30**	4.12	5.49**	4.14
Confusion	4.92**	3.87	3.83**	4.02
Happiness	7.15	3.82	6.58	4.07
Calmness	7.92**	3.46	7.03**	3.72

N = 106. ANOVA: analysis of variance.
**$p < .01$.

and culture, the majority (77%) listens to English language music and only 19% prefer traditional Asian music (National Music Consumption Survey, 2017). Furthermore, although locally produced Singaporean music is generally Western-based with some local features, it is generally regarded as somehow inferior to Western models (Fu, 2015). Thus, the choice of purely Western music should have reduced the potential of confounding factors to cause additional emotional reactions and was also consonant with the proposition that Singaporeans might exhibit bimusicalism.

All participants were provided with an information sheet and gave informed consent before the experiment began, and only then were they randomly assigned for positive or negative mood induction. Participants were given standardized instructions explaining the experimental procedure, then they completed the pre-MMIP set of questionnaires including some demographic questions, BRUMS, and PANAS. The song selected for the MMIP was then repeatedly played at a consistent volume for 7 min, then the participants were asked to complete BRUMS, and PANAS again for the post-MMIP measurements. Series of mixed analyses of variance (ANOVAs) were used to analyze the effects of the two MMIPs on the participants' affective states.

Results

Music mood induction and BRUMS

A series of two-way mixed ANOVAs with positive/negative music in the MMIP as the between-subjects factor and pre- and post-BRUMS mood scores as the within-subject factors were conducted. The results showed that there were significant decreases in three of the eight moods measured by BRUMS: Calmness—main effect pre- and post-measurement, $F(1, 104) = 7.54$, $p = .007$; Fatigue—main effect pre- and post-measurement, $F(1, 104) = 24.72$, $p < .001$; and Confusion—main effect pre- and post-measurement, $F(1, 104) = 11.96$, $p = .001$ (see Table 1). There were no significant main effects for the between-subject factor (the type of music in the MMIP) for any mood measured by BRUMS, but there were significant interaction effects for Happiness, $F(1, 104) = 6.23$, $p = .014$, and Vigor, $F(1, 104) = 29.16$, $p < .001$. Participants in the positive MMIP showed slight increases in Happiness and significant increases in Vigor, whereas those in the negative MMIP showed significant decreases in Happiness and small decreases in Vigor.

This suggests that the MMIP did have some impact on moods. In line with previous studies (Akbari Chermahini & Hommel, 2012; Harkness et al., 2010) to investigate the precise impact of

Table 2. Changes in mood after positive and negative music induction.

	Positive induction					Negative induction				
	Before		After			Before		After		
	M	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
Anger	2.40	3.11	2.60	3.71	−0.44	4.20	4.14	3.11	3.83	2.02*
Tension	2.94	3.23	2.98	4.08	−0.10	4.56	3.79	3.50	3.57	2.59*
Depression	3.79	4.12	3.17	4.45	1.61	4.17	3.80	3.94	3.28	0.48
Vigor	5.94	3.40	8.60	4.51	−6.03**	7.39	3.76	6.11	3.81	2.22*
Fatigue	7.65	4.46	5.17	4.76	4.35**	6.96	3.78	5.80	3.47	2.51*
Confusion	4.63	3.91	3.56	4.37	2.49*	5.20	3.85	4.09	3.67	2.41*
Happiness	6.54	3.79	6.92	4.52	−0.75	7.74	3.80	6.26	3.59	2.73*
Calmness	7.67	3.47	6.35	3.96	3.13**	8.15	3.47	7.69	3.38	0.94

*$p < .05$, **$p < .01$.

the positive and negative MMIPs independently, the mood ratings for each condition before and after the mood induction procedure were compared using paired-sample *t*-tests as shown in Table 2.

As can be seen from Table 2, the positive and negative MMIPs did have a range of significant impacts on mood. In the positive MMIP, the positive mood Vigor increased and there were reductions in the negative moods Fatigue, Confusion, and Calmness. In the negative MMIP, there were decreases in the positive moods of Vigor and Happiness, and also decreases in the negative moods of Anger, Tension, Fatigue, and Confusion. Thus, it appeared that the MMIPs broadly impacted moods by reducing the intensity of both positive and negative moods irrespective of whether the music played during the MMIP was positive or negative. Vigor was the only mood that increased in intensity and only within the positive MMIP. Overall, therefore, it might be said that music had a broadly positive impact on mood by reducing negative emotions irrespective of whether the music played during the MMIP was happy or sad.

Music mood induction, PA, and NA

To test the impact of the MMIP on PA and NA, a two-way mixed ANOVA with positive/negative music as the between-subjects factor and pre- and post-measurements of PA and NA as the within-subjects factor was performed. There were no significant main effects for these variables, but there was a significant interaction effect for PA, $F(1, 104) = 26.57$, $p < .001$, with PA increasing in the positive MMIP and decreasing in the negative MMIP. There was also a significant interaction effect for NA, $F(1, 104) = 6.36$, $p = .013$, but not in the direction expected: NA increased in the positive MMIP and decreased in the negative MMIP (Figure 1).

To investigate the precise impact of the positive and negative MMIPs independently, the PA and NA, for each condition before and after the MMIP procedure were compared using paired-samples *t* tests as shown in Table 3.

As Table 3 shows, the music induction procedures did have some impacts on the affective states. PA significantly increased in the positive MMIP while both PA and NA decreased in the MMIP negative condition.

Discussion

The aim of the present research was to explore the extent to which a MMIP using Western popular music might cause changes in the affective states of Asian participants. The results

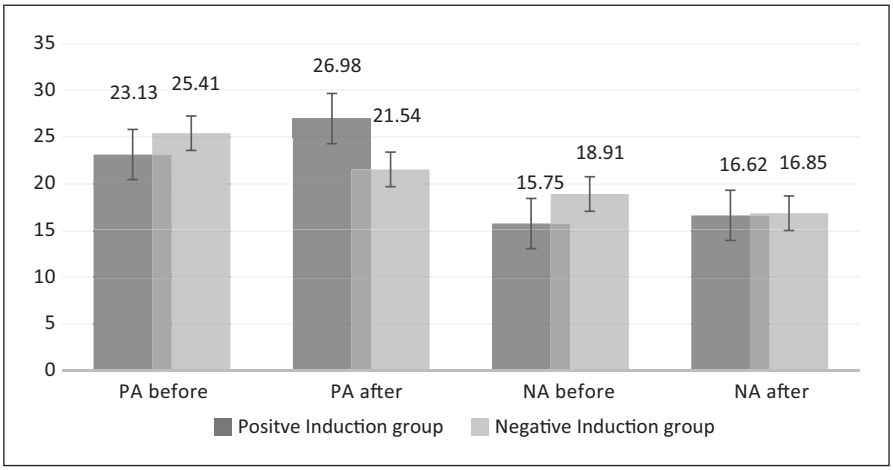

Figure 1. PA and NA scores before and after MMIP for positive and negative induction groups.

Table 3. Changes in positive and negative affect after mood induction.

	Positive induction					Negative induction				
	Before		After			Before		After		
	M	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
Positive Affect	23.13	8.18	26.98	10.45	−3.54**	25.41	9.02	21.54	8.41	3.75**
Negative Affect	15.75	6.52	16.62	8.54	−1.06	18.91	7.37	16.85	6.59	2.51*

*$p < .05$, **$p < .01$.

showed that music caused changes in several moods and also in the fundamental affective systems that are thought to underlie mood formation, showing that music offers an effective means to modify moods among Asian participants. Moreover, the fact that the music that achieved these effects was Western in character suggested that Singaporean participants displayed some degree of bimusicalism.

In line with our first hypothesis, the negative music induction procedure led participants to report decreases in the positive moods of Vigor and Happiness as expected, but also led to reported decreases in Anger, Tension, Fatigue, and Confusion. However, contrary to our expectation, Depression and Calmness were unaffected. This finding partially supported those reported by Linnemann et al. (2015) by showing that participants' subjective ratings of the stress-related emotions Anger, Tension, and Confusion were reduced. However, the pattern of attenuative relationships did not support Thayer's (2012) proposed binary model which places tiredness and energy on one axis and calmness and tension on the other. In the present research, Calmness and Depression were unaffected, but the energetic emotions of Vigor and Happiness, and the tiredness emotion of Fatigue all decreased, suggesting that there is not a unitary energy–tiredness axis. Indeed, our findings suggested that the positive and negative moods are distinct rather than opposites and that they changed in response to independent underlying causes that are not consistent with Thayer's model, but that might be suggestive of the bivalence hypothesis proposed by Watson and Tellegen (1985).

Our second contention was also partially supported because in the positive MMIP, the energetic emotion Vigor increased, whereas Calmness, Fatigue, and Confusion all decreased lending some support to Thayer's binary model, yet also somewhat contradicting the finding made by Linnemann et al. (2015) that all music reduces perceptions of stress. Indeed, even though some emotions were affected by the happy music, the fact that the negative emotions of Anger, Tension, and Depression remained unchanged casts some further doubt on Thayer's binary model suggesting that it may not provide a comprehensive explanation of the relationships between moods. The pattern of relationships between the musical inductions and changes in mood may also have been indicative of an interface between the participants' cultural background and their extent of bimusicalism. The impact of the positive MMIP on Vigor, Fatigue, and Calmness indicated that the participants responded to energetic music in the same ways that would have been expected of Westerners suggesting a degree of bimusicalism, but the fact that levels of Happiness were unchanged may have reflected the Asian cultural norm of favoring low arousal emotions in line with the findings of Hu and Lee (2012).

In order to investigate our proposition that changes in PA and NA would be in the same directions as changes in moods, we reviewed the impact of the music induction procedures on PA and NA. The positive music induction increased PA as we predicted, but contrary to our expectation, the negative music induction procedure decreased both PA and NA. Although happy music led participants to experience higher PA, the fact that it had no impact on NA suggested these two dimensions were independent, supporting the bivalent model proposed by Watson and Tellegen (1985; Watson et al., 1999). However, in contrast, the finding that the sad music induction procedure reduced both PA and NA cast some doubt on this model. Given the preceding discussion, it is possible that happy music is best able to reinforce existing positivity rather than attenuate NA, and that PA is more susceptible to change through music induction than NA, although why this might be the case clearly needs further exploration.

The finding that NA was only impacted by sad music might also offer an explanation for why people listen to sad music. The primary motivation for listening to sad music is to improve the listener's mood, making listening to sad music an effective regulation strategy (Saarikallio, 2008). This is because deepening sadness may lead to a cathartic experience that ultimately reduces participants' sad moods (Matsumoto, 2002). Contrary to the findings of Garrido and Schubert (2015) that sad music significantly increased participants' depression, the sad music used in the present study did not significantly impact depression. However, the fact that the negative MMIP did cause a significant change in NA suggests that the participants interpreted the music correctly, giving further evidence of their bimusicalism. It is possible that in Western participants, sad music impacts mood by increasing NA to such a level that depression deepens sufficiently to trigger catharsis which in turn leads to a reduction in NA and sadness. Thus, the fact that the levels of Depression did not significantly change in the present Asian sample could be indicative of the fact that the participants regulated their emotions in the ways that have been found among other Asian participants (Lim, 2016). If sad music does impact NA in the same ways in both Westerners and Asians, then it is possible that culturally specific emotion regulation strategies lead to different mood outcomes, a suggestion that clearly needs further exploration.

Although the present study suggests some promising lines of future enquiry, we must also be alert to its potential limitations. The fact that emotional reactions to music are often idiosyncratic and influenced by personality, culture, age, gender, and personal memories related to particular songs (Van den Tol & Edwards, 2015) means that one of more of these factors could have been confounds in the present research. Given that emotions are heavily influenced by mood (Hume, 2012) and moods are heavily influenced by an individual's environment (Wilhelm & Schoebi, 2007), the social context in which the present research was conducted,

specifically the presence of other participants, may also have altered participants' responses to emotionally salient stimuli (Forbes & Dahl, 2005). It is possible that group effects are further magnified among participants drawn from a collectivist Asian society such that some participants responded to the music induction in ways different to how they would have responded when alone so further research is needed to render a fuller picture of individual differences in emotional reactions to music.

The present study demonstrated that Asian participants can exhibit bimusicalism such that Western music can produce significant affective reactions in Asian listeners. However, changes in the systems underlying mood formation are not necessarily reflected in changes in mood, which suggests that although music can serve as an effective mood regulator, cultural factors may be equally important determinants of how much moods are expressed.

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