The Music USE (MUSE) Questionnaire: An Instrument to Measure Engagement in Music

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Active engagement with music has been associated with cognitive, emotional, and social benefits, although measures of musicianship are typically limited to music training. A self-report questionnaire was developed to assess both quality and quantity of different forms of music use, with eight music background items, and a further 124 items testing music engagement. Analysis of engagement items with an initial sample ($N = 210$; mean age = 37.55 years, $SD = 11.31$) generated four reliable engagement styles (Cognitive and Emotional Regulation, Engaged Production, Social Connection, Dance and Physical Exercise). Analysis of an independent sample with a refined 50-item scale ($N = 124$; mean age = 22.78 years, $SD = 6.17$) supported the findings, further differentiating between "Physical Exercise" and "Dance." Taken together with the eight music background items, the Music USE (MUSE) questionnaire can be used as a 58-item, or in a reduced 32-item format.[1] Validity was demonstrated in relationships between music background indices, styles of music engagement, demographics, the brief Music Experience Questionnaire (Werner, Swope, & Heide, 2006), and the Emotion Regulation Questionnaire (Gross & John, 2003). The MUSE offers researchers a sensitive approach to exploring benefits of music engagement, by encapsulating both quality and quantity dimensions of music use.

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Music is a highly complex and engaging multisensory activity (Münte, Altenmüller, & Jäncke, 2002) that depends on the interdependent processes of music production and music reception (Elliott, 1995). Research on the benefits of music has, nonetheless, been heavily focused on contrasting the abilities of musicians and nonmusicians. Little attention has been directed at benefits of various forms of music reception, or at the influence of differing levels of engagement with music. Nevertheless, these constructs are arguably as central to musicianship as years of formal music training. In this paper, we explore a more comprehensive model of musicianship, and introduce a self-report instrument that captures both quantity and quality dimensions of producing and receiving music.

Production and Reception Processes of Music

Production. Musicianship has been almost exclusively operationalized in research as a specialized capacity to *produce* music. This definition tends to be further limited to years of formal music training, which generally excludes musicians who compose music, or perform music without formal training (such as self-taught musicians). The quality of music performance is not central in this definition, and tests of musical ability or aptitude (e.g., Gordon, 1965; 1989; Seashore, 1919) are seldom used as an index of musicianship. The importance of performing music to the individual and the reasons for playing are also excluded, although engagement and motivation are likely to be heterogeneous within this group.

Conclusions about the benefits of music subsequently tend to be drawn from a comparison of individuals with ("musicians") or without ("nonmusicians") a certain level of formal music training (extensively reviewed elsewhere, see Chin & Rickard, 2012; Schellenberg, 2001). Recent studies have demonstrated that even within musicians, the level of expertise varies widely (Bangert & Schlaug, 2006; Nikjeh, Lister, & Frisch, 2008). Criteria for inclusion as a musician are also inconsistent across studies, ranging from enrolment in a tertiary education music school to tenure in a professional orchestra

[1] Formatted versions of the current shortened and full MUSE, with scoring keys, are available directly from the authors: tanchyuan.chin@monash.edu or nikki.rickard@monash.edu

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(Chin & Rickard, 2012; Margulis, 2008), with years of training ranging from at least 2 years (e.g., Andrews & Dowling, 1991) to at least 6 years (Chan, Ho, & Cheung, 1998). Therefore, while quantitative indices of music training are widely used to define musicianship, and may be sufficient if the effects of music training duration are of primary interest, the research field may benefit from a more comprehensive operationalization.

Reception. Music listening has been defined as the processing of musical information, or thinking musically (Elliott, 1995). While music listening is covert and not necessarily observable, it is typically measured by the frequency (e.g., times per week) or duration (e.g., hours per day) of intentional music listening. As with music production, extensive exposure to, and analysis of, complex music is likely to refine auditory processing abilities in advanced music listeners (Finnas, 1989; Hedden, 1981; Lerdahl & Jackendoff, 1983). Studies have demonstrated that individuals *without* formal music training are able to discriminate musical excerpts and musical structures (such as tensions and relaxations in melodies and harmonic sequences) in a similar way as did individuals with formal music training (Bigand, 2004; Bigand & Poulin-Charronnat, 2006). In a series of experiments, Krumhansl (1995) reported that individuals with varying levels of music training made similar melodic continuation judgments. This degree of consistency suggests that music expectancy is independent of an individual's music experience or training. These results demonstrate that implicit learning of complex musical sounds through simple, passive exposure to environmental stimuli may be sufficient to develop an advanced sensitivity to music. In support, a substantial body of cognitive and neurophysiological data now demonstrates that classification of musical stimuli and early cortical responses to music features are to a large extent independent of music training (Bigand, 1990; Koelsch, Grossmann, Gunter, Hahne, Schröger, & Friederici, 2003; Koelsch, Gunter, Friederici, & Schröger, 2000; Trainor, Desjardins, & Rockel, 1999). However, music reception also extends beyond quantitative indices, requiring the interpretation and construction of auditory information in relation to personal understanding and beliefs (Elliott, 1995). An investigation of the relationship between self-reported "tone deafness" and congenital amusia found that an individual's "Listening Attitudes" score is predictive of one's test score on the Montreal Battery of Evaluation of Amusia (MBEA; Peretz, Champod, & Hyde, 2003), over and above years of formal music instruction (Cuddy, Balkwill, Peretz, & Holden, 2005). High self-assessment of this predictive factor of listening attitude reflects the frequent seeking out, and engagement with, music in one's environment (Cuddy et al., 2005). As with music production, individuals can differ in their engagement with music to which they are listening, and the reasons for listening will also vary.

MUSIC ENGAGEMENT

Engagement is described as the connection between an individual and an activity of interest (Russell, Ainley, & Frydenberg, 2005) and reflects the individual's active involvement or participation in the activity (Reeve, Jang, Carrell, Jeon, & Barch, 2004). Engagement is often described as an emotional or intellectual commitment to an activity or task (Saks, 2006) — or a state of being — that occurs with the simultaneous presence of vigor, dedication, and absorption (Maslach, Schaufeli, & Leiter, 2001; Schaufeli & Bakker, 2004; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). In this context, the construct of engagement is related to motivation, which can be either intrinsic or extrinsic (Sloboda, 2005). Intrinsic motivation develops from intense pleasurable experiences with music, leading to a deep personal commitment to music. Extrinsic motivation derives from outside of the individual and is mainly concerned with achievement of certain goals, such as gaining approval from parents or winning competitions.

Engagement can be measured in both covert attitudinal terms, and the presence of certain behaviors. Attitudinal definitions emphasize the centrality of an individual's feelings, thoughts, and state of mind to the construct of engagement. For example, Harter, Schmidt, and Hayes (2002) define engagement as "the individual's involvement and satisfaction with as well as enthusiasm" (p. 269) for an activity. Motivation can be measured through observable behaviors such as choices and preferences of individuals, intensity, persistence, and quality of investment in task. Examples include choosing music practice over an alternative extracurricular activity, the level of commitment to a group or band, the amount of time invested in learning a musical instrument, the attention given during the rehearsal session, and the emotional and intellectual investment in musical activities.

Definitions that describe engagement in behavioral terms depict engagement as the presence of certain types of actions or performance. Dvir and colleagues (2002, p. 737) define "active engagement" in behavioral terms as "high levels of activity, initiative, and responsibility." Active engagement with music can then be quantified by indices such as time spent on a music activity, frequency and regularity of participation, as well as personal commitment and motivation to learn, practice or complete a certified music course or program. Music engagement can therefore be conceptualized as an individual's level

of active participation in music activities, measured by the frequency and regularity of participation, and the value assigned to the music activity. The importance and value of music activities is a dimension of musicianship which is therefore distinct from frequency or duration of participation.

FUNCTIONS OF MUSIC

Functional imaging studies show that both music production (Sergent, Zuck, Terriah, & MacDonald, 1992) and music reception (Koelsch, Fritz, von Cramon, Muller, & Friederici, 2006) are associated with widespread activation of distribution cortical and subcortical brain systems. For instance, music listening extends well beyond the auditory cortex, involving a bilateral network of frontal, temporal, parietal, and subcortical areas related to attention, semantic and music-syntactic processing, memory, and motor functions (Bhattacharya, Petsche, Feldmann, & Rescher, 2001; Janata et al., 2002; Koelsch et al., 2004; Popescu, Otsuka, & Ioannides, 2004), as well as limbic and paralimbic regions related to emotional processing (Blood & Zatorre, 2001; Blood, Zatorre, Bermudez, & Evans, 1999; Brown, Martinez, & Parsons, 2004; Koelsch et al., 2006; Menon & Levitin, 2005). This widespread activation implies that music production and reception have diverse functions relating to one's emotion, cognitive and psychosocial functioning

A number of survey or interview studies have explored the various functions of music in people's lives. For instance, Chamorro-Premuzic and Furnham (2007) obtained responses from 341 participants on their use of music. The major functions of music cited were for intellectual satisfaction (such as analyzing complex musical compositions), emotional regulation, and as a background to other activities. Hargreaves and Colman (1981) found that individuals' qualitative evaluations of responses to music were mostly categorized as an analytic/technical or affective style. Other research has concluded that individuals engage in music listening and other musical activities for self-regulatory purposes (DeNora, 1999; North, Hargreaves, & O'Neill, 2000; Saarikallio & Erkkilä, 2007) and establishment of self-identity (North et al., 2000) and interpersonal relationships (North & Hargreaves, 2007). In sum, uses of music can be categorized as either for cognitive, affective, social, or physical purposes (DeNora, 2000; Hargreaves & Colman, 1981; Hargreaves & North, 1999; Sloboda, O'Neill, & Ivaldi, 2001).

Analytical functions. Chamorro-Premuzic and Furnham (2007) found that an individual's tendency to engage with music in a rational or cognitive manner was associated more generally with an interest in acquiring or increasing knowledge. This "intellectual" form of engagement with music focuses on the performance of the musicians or the musical structure of the composition. Neuroimaging studies show that brain activation as a result of music listening extends well beyond the auditory cortex to regions involved in executive function (such as orbitofrontal and cingulate cortex) and memory (such as the hippocampus). It would not be surprising then, for individuals who often seek intellectually stimulating experiences with music, to develop an advanced level of auditory processing of music stimuli, despite not having any form of music training. A recent study demonstrated that verbal memory performance could be predicted by duration and frequency of music listening (Chin & Rickard, 2010), suggesting that extended listening may hone verbal processing abilities.

Affective functions. Neuroimaging studies of responses to music have also demonstrated the involvement of brain systems typically associated with emotion and rewards, including the orbitofrontal cortex, anterior cingulate, amygdala, and ventral medial prefrontal cortex (Blood & Zatorre, 2001; Blood et al., 1999; Koelsch, Fritz, Schulze, Alsop, & Schlaug, 2005; Koelsch et al., 2006; Menon & Levitin, 2005). It is not surprising then that music listening has overtaken most leisure activities - such as reading or watching television or movies - as the most popular leisure choice for individuals (Rentfrow & Gosling, 2003).

In particular, music listening is commonly cited as an effective means of regulating emotions (North et al., 2000) and enhancing positive and reducing negative affective states. Emotion is often reported as the primary reason people report for listening to music (Sloboda, 2010), and music has been found to be one of the most powerful ways of inducing strong emotional and spiritual experiences (Gabrielsson, 2010). Music is, however, also used to reduce negative emotional states, and is often used for relaxation purposes or as background accompaniment to everyday activities (Chamorro-Premuzic & Furnham, 2007; North, Hargreaves, & Hargreaves, 2004; Sloboda, 2010).

In a study of 2,465 English adolescents, reasons cited for playing and listening to music were surprisingly consistent. The adolescents reported using music for identity and mood-regulating reasons, namely, to create an external impression, to fulfill emotional needs, and for enjoyment (North et al., 2000). In an interview study involving 52 women between the ages of 18 to 78 years, DeNora (1999) found that participants drew upon elaborate repertoires of music and displayed a sharp awareness of the use of music, despite not being

accomplished musicians. Saarikallio (2010) interviewed 21 adults between the ages of 21 and 70 years, and reported that these individuals, who engaged leisurely with music, used music for emotional self-regulation. Research has demonstrated that use of emotion regulation strategies such as reappraisal is associated with enhanced interpersonal functioning and well-being (Gross & John, 2003). However, research reviewed thus far has overlooked this non-performance aspect of music engagement.

Social functions. Another commonly cited function of music is for social communication. According to Green (1999), music aids adolescents' construction and presentation of self. For instance, adolescents reported using music for reducing loneliness, and more importantly, as a badge of identity for inter and intragroup self-definition (North et al., 2000). This is also related to the experimental finding that individuals derive positive self-esteem from being members of a cohesive social group, and such social groups can be formed through common musical tastes (North & Hargreaves, 2007). Music presents an opportunity for social interaction between individuals, and common examples of social engagement with music include participation in community choirs or bands, and attending concerts with family and friends. Cunningham, Jones, and Jones (2004) reported that personal music collections are often shared between family and friends, which involves a "sharing of an experience that has been emotionally or intellectually significant, an opportunity for strengthening bonds between friends, or a chance to broaden one's musical horizons" (p. 451).

Physical functions. Music involves not just the auditory system, but also the somatosensory and motor systems (Freeman, 2000). Dancing involves the integration of music and movement, allowing the individual to express themselves. Music is also used during exercise to reduce awareness of bodily sensations of fatigue and has been shown to exert significant effects on exercise endurance (Copeland & Franks, 1991; Karageorghis, Terry, & Lane, 1999; Nethery, 2002; Potteiger, Schroeder, & Goff, 2000). For instance, Copeland and Franks (1991) found that soft, slow music improved treadmill endurance when compared to a no-music control condition. Physical functions of music use are also common in treatment of motor symptoms in neurodegenerative disorders and stroke. Music therapies such as Active Music Therapy (Pacchetti et al., 2000) and Rhythmic Auditory Stimulation (Thaut & Abiru, 2010) are believed to relieve motor symptoms by providing stimulation of multiple sensory organs and motor pathways, or by entraining motor responses to the external rhythmic cue of the music.

MEASUREMENT OF MUSICIANSHIP

A number of important steps have been taken to include aspects of engagement in the measurement of musicianship. In terms of performance, several studies have defined musicians by their current and past musical experience, as well as their level of musical sophistication (Cuddy & Cohen, 1976; Cuddy & Lyons, 1981; Ollen, 2006; Preisler, 1993). Nonperformance music activities can also be explored with several instruments, albeit to a limited extent. The brief version of the Music Experience Questionnaire (BMEQ) by Werner et al. (2006) assesses various aspects of music experiences through 53 self-reported items about general responses to music. This questionnaire provides useful insight into the various ways in which individuals respond to music, although interpretation from this instrument is limited by generalizability (the instrument was derived from an entirely college sample) and reliability (at least one of the subscales is consistently weak). The 15-item Uses of Music Inventory (Chamorro-Premuzic & Furnham, 2007) summarizes individual differences in three different areas of music use; namely, emotional, cognitive, and background, although the authors note that other ways in which individuals use music, such as using music for physical/artistic activities or as a medium for connection, are not addressed by their scale of music use. Similarly, there are several instruments that focus on one of the functions of music in more detail. For instance, the music-empathisizing-systematizing (ME-MS) measures two cognitive styles of music listening (Kreutz, Schubert, & Mitchell, 2008), while the Music in Mood Regulation (MMR; Saarikallio, 2008) and Music Mood-Regulation Scale (MMRS; Hewston, Lane, & Karageorghis, 2008) distinguish different ways in which music is used to regulate emotions.

No previous instrument, however, encapsulates the range of processes, functions, and underlying motivations of music engagement reviewed here, despite evidence that they can differentially impact cognitive, emotional, psychosocial functioning, and physical health. The aim in the present study was to develop an instrument that assesses the multidimensional and continuous nature of musicianship, which extends the concept of "musicianship" beyond formal music training and performance factors, and captures both quantity *and quality* of music production *and reception*. A description of the development of the music engagement questionnaire is provided in Study 1. A separate sample was recruited in Study 2 to establish preliminary validity and reliability of the music engagement styles identified in Study 1. The relationship between the identified music engagement styles and demographic variables such as

gender, education level, employment, and income was also examined. In addition, individuals' tendency to engage with music in the various ways was compared with their use of emotion regulation strategies.

Study 1 – Questionnaire Development

Method

PARTICIPANTS

Study 1 recruited 210 participants (152 females and 58 males) between the ages of 19 and 57 (mean age = 37.55 years, *SD* = 11.31). Participants were recruited via posters and word-of-mouth through staff and students of Monash University. All procedures were approved by the University's Standing Committee on Ethics in Research in Humans. Demographics are presented in Table 1.

MATERIALS

Measure of music engagement. A wide variety of music activities, including both aspects of music production and reception, were first identified via an extensive literature review. Items incorporating these music activities were then generated for each of the previously identified functions of music (cognitive, emotional, social, and physical), further differentiated by the type of motivation. Items were developed in several contexts, including focus groups with peers from within the scientific community and workshops of students studying music psychology at university level. Content validity of final items was verified by discussion with music psychology experts. Examples of items generated for each of the 16 nested cells (7-8 items per cell) pertaining to each process, function, and motivation are presented in Table 2.

The questionnaire comprised two sections, with questions in the first section addressing demographic background, music instruction, instrumental playing experience, and music listening habits. The three quantitative indices include an Index of Music Training (IMT), which captures an individual's music background, as assessed by the highest level of formal music training, other types of informal music training, and completion of certified examinations; an Index of Music Instrument Playing (IMIP), which assesses the intensity of practice, measured by the duration and frequency, as well as the regularity of instrument playing; and an Index of Music Listening (IML), which assesses the amount of music listening, measured by the frequency and duration of intentional music listening. The second section comprised 124 items that explored the styles of music engagement. The Music USE (MUSE) questionnaire was made available online via SurveyMethods (www.surveymethods.com). Responses to item statements were made on a 5-point Likert scale ranging from "1" ("not at all" or "not applicable") to "5" ("always" or "extremely") for both "frequency" and "value" of that item. Results for ratings on frequency and value were highly correlated, and so the product of both scales was used in analyses.

PROCEDURE

After agreeing to participate in this study, participants were provided with the link to the website, where they provided informed consent and completed the online questionnaire. Participants completed the MUSE questionnaire in approximately 25 min.

Results and Discussion

Data screening and analyses were conducted using Predictive Analytics Software version 18 (PASW18). Participants' response date and timings were checked, as per the guidelines recommended for web-based experiments (Reips, 2002). Prior to data analysis, examination of the data indicated no missing values and variables were normally distributed, with no major concerns over multicollinearity.

FACTOR STRUCTURE OF THE MES SCALE IN STUDY 1 (N = 210)

A principal components analysis was conducted in order to reduce the 124 engagement items. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO = .86, and a significant Bartlett's test of sphericity $\chi^2(7626) = 24196.52$, $p < .001$, indicated that correlations between items were sufficiently large for factor analysis (Field, 2009). Based on the scree plot and Horn's parallel analysis (Thompson, 2004), four factors were retained, which in combination explained 46.48% of the variance (see Table 3 for variance of each factor). Varimax rotation was used for all factor analyses.

In analyses of data from this sample, four styles (see Table 3) of an individual's engagement with music were refined based on theoretical and statistical conditions aimed at increasing reliability and internal consistency of each scale. In the scale development phase of the analyses for Study 1, four additional criteria were set:

1. item loadings were at least .35 and above
2. interitem correlations were between .35 and .70
3. item-total correlations were at least .40 and above
4. Cronbach's alpha coefficients were .70 and above (Clark & Watson, 1995)

TABLE 1. Demographics of Both Samples

		Study 1 (N = 210)		Study 2 (N = 154)	
Gender	**Female : Male**	152 : 58		108 : 46	
Age	**Mean (*SD*)**	37.14 (11.08)	38.60 (11.93)	22.82 (6.39)	22.67 (5.68)
Highest Educational Level					
	No higher than Year 10 of high school	13	(6.19%)	9	(5.84%)
	Completed Apprenticeship / VCE	37	(17.62%)	62	(40.26%)
	TAFE / College Diploma	38	(18.10%)	22	(14.29%)
	Undergraduate University Degree	73	(34.76%)	48	(31.17%)
	Post Graduate University Degree	49	(23.33%)	13	(8.44%)
Employment					
	Unemployed	10	(4.76%)	14	(9.09%)
	Working part time (not studying)	33	(15.71%)	2	(1.30%)
	Completing Undergraduate University Degree	25	(11.91%)	98	(63.64%)
	Completing Post Graduate University Degree	7	(3.33%)	15	(9.74%)
	Working full time	109	(51.91%)	24	(15.58%)
	Missing	26	(12.38%)	1	(0.65%)
Annual Household Income					
	$0 - $34,999	24	(11.43%)	48	(31.17%)
	$35,000 - $69,999	63	(30.00%)	36	(23.38%)
	$70,000 - $104,999	53	(25.24%)	24	(15.58%)
	$105,000 - $139,999	30	(14.29%)	15	(9.74%)
	$140,000 or above	33	(15.71%)	28	(18.18%)
	Missing	7	(3.33%)	3	(1.95%)
Highest Level of Formal Music Training					
	None	71	(33.81%)	36	(23.38%)
	Primary	45	(21.43%)	25	(16.23%)
	Secondary	70	(33.33%)	80	(51.95%)
	Tertiary	6	(2.86%)	12	(7.79%)
	Post-graduate	18	(8.57%)	1	(0.65%)
Board Certified Examinations					
	None	172	(81.91%)	83	(53.90%)
	Grade 1 to 3	18	(8.57%)	15	(9.74%)
	Grade 4 to 5	9	(4.29%)	17	(11.04%)
	Grade 6 to 8	11	(5.23%)	39	(25.32%)

Note: Board Certified Examinations: Associated Board of the Royal School of Music (ABRSM) or Australian Music Examinations Board (AMEB)

TABLE 2. Item Matrix Consisting of Two Music Processes, Two Motivations and Four Functions of Music Use From Which Items Were Generated, With Sample Items in Each Cell

	Function			
Process & *Motivation*	**Cognitive**	**Emotional**	**Social**	**Physical**
Reception *Intrinsic*	I often listen to new compositions	I often listen to music when I'm feeling down	There is a greater connection with my friends when we like the same music	I feel more energetic after listening to music
Extrinsic	Certain type of music helps me think	Music often takes away tension at the end of the day	Having similar taste in music often helps me relate better to my peers	Music provides me with a good pace for exercising
Production *Intrinsic*	Being able to improvise whilst playing music gives me a great sense of satisfaction	Performing music is emotionally rewarding for me	I often look forward to attending practices with my friends	Dance is an expression of my feelings
Extrinsic	Mastering this piece of music gives me greater recognition as a performer	Playing music is an outlet for my frustrations	I often get recognition from my friends for playing in the band	Practice helps me improve my music playing skills

Based on the above criteria, top loading items from each of the four styles were short-listed for further testing and validation in Study 2. Following the factor analysis, the internal reliability of each was assessed using Cronbach's alpha, and the alpha reliability coefficients are presented in Table 3.

All four styles displayed sound reliability with alpha coefficients ranging from .77 to .95 ($M = .87$). Scale scores were generated by summing items without standardization or weighting. All corrected item-to-own scale correlations were at least .40, supporting summation without applying item weights. Inspection of the items led to the following interpretations. MES-I reflects a combination of uses of music for cognitive and emotional self-regulatory purposes. MES-II reflects an individual's level of active engagement with music production. MES-III focuses on the social aspects of music engagement. MES-IV contains

TABLE 3. Variance and Alpha Reliability Coefficients of the Music Engagement Styles

	Study 1 ($N = 210$)			
	% of variance			
Music Engagement Style (MES)	Before rotation	After rotation	Cronbach's Alpha	Number of items
MES-I Cognitive & Emotional Regulation	28.47	19.58	.95	26
MES-II Engaged Production	11.49	15.36	.94	10
MES-III Social Connection	3.52	7.73	.77	8
MES-IV Dance & Physical Exercise	3.01	3.82	.80	6

TABLE 4. **Correlations Between Music Engagement Styles, Indices, and YoT**

	MES-I	MES-II	MES-III	MES-IV	IML	IMT	IMIP	YoT
MES-II	.27**	1						
MES-III	.64**	.31**	1					
MES-IV	.58**	.01	.51**	1				
IML	.41**	.22**	.29**	.24**	1			
IMT	.16*	.45**	.09	.02	.10	1		
IMIP	.04	.44**	.06	-.05	-.01	.34**	1	
YoT	.06	.43**	.03	-.04	.06	.58**	.72**	1

Note: MES-I: Cognitive & Emotional Regulation; MES-II: Engaged Production; MES-III: Social Connection; MES-IV: Dance & Physical Exercise; IML: Index of Music Listening; IMT: Index of Music Training; IMIP: Index of Music Instrument Playing; YoT: Years of training; * $p < .05$, ** $p < .01$

items that focused particularly on engagement with music through dance and physical health purposes.[2]

RELATIONSHIPS BETWEEN MUSIC ENGAGEMENT STYLES AND INDICES

Pearson correlations between the Music Engagement Styles, the Indices of Music Listening (IML), Music Training (IMT), Music Instrument Playing (IMIP), and years of training (YoT) are presented in Table 4.

The Index of Music Training (IMT) correlated positively with the Index of Music Instrument Playing, as well as MES-I (Cognitive and Emotional Regulation) and MES-II (Engaged Production). Rather similar patterns of associations were noted for the commonly used measure of musicianship, years of training (YoT), except for the absence of correlation with MES-I. Strong correlations also were evident between this measure (YoT) and our measure of IMT.

Partial correlations were used to assess the linear relationship between engaged production (MES-II) and music instrument playing (IMIP), after controlling for years of training. The partial correlation was statistically significant, $r\,(207) = .21$, $p = .003$. After controlling for years of training, 4.4% of the variability in music instrument playing could still be accounted for by the variability in engaged production.

RELATIONSHIPS BETWEEN GENDER, EDUCATIONAL LEVEL, EMPLOYMENT, INCOME AND MUSIC ENGAGEMENT

Spearman's correlation was performed to examine the relationship between the demographic variables and each of the MES subscales (see Table 5). Males were more likely to engage with music for MES-II (Engaged Production), whereas females were more likely to engage with music

TABLE 5. **Correlations Between Music Engagement Styles, and Demographic Variables**

	MES-I	MES-II	MES-III	MES-IV
Gender#	.12	-.17*	.08	.28**
Education	-.02	.05	.01	-.02
Employment	-.03	.00	.03	-.02
Annual household income	-.04	-.23**	-.13	.07

#Gender: males = 1, females = 2.
Note: MES-I: Cognitive & Emotional Regulation; MES-II: Engaged Production; MES-III: Social Connection; MES-IV: Dance & Physical Exercise; * $p < .05$, ** $p < .01$

[2] Prior to varimax rotation, an alternative solution with eight factors was obtained. All items loading on the first factor were music reception items and all items loading on the second factor were music production items, confirming two distinct ways individuals process music. The initial 8-factor model included two factors from the 4-factor model, Engaged Production and Social Connection. The loading of items in Cognitive and Emotional Regulation was divided onto four different factors, with items reflecting personal inspirational attitudes towards music, active listening, and reminiscent effect of music, as well as using music for cognitive and emotional regulation purposes. Similarly, loading of items in Dance and Physical Exercise was divided onto two different factors, with items representing an individual's use of music for physical health purposes, and engagement with music through dance. Strong correlations were found between these factors, and with the two main factors of the initial 8-factor model accounting for considerably more variance than the other factors combined, the 4-factor model was retained.

for MES-IV (Dance & Physical Exercise). There were no significant associations between education, employment status, and the MES subscales. Annual household income was negatively correlated with MES-II.

Study 2 – Refinement and Psychometric Testing of Questionnaire

Results from Study 1 suggest that apart from music training and performance, individuals adopt several other ways of engaging with music. The aim of Study 2 was to establish reliability and validity of this novel questionnaire. In this study, only the revised MES scale of 50 items from Study 1 was utilized. Nine of the 50 items were reverse scored items to prevent individuals from adopting a rapid response pattern with the Likert scale ratings without reading the item description.

Method

PARTICIPANTS

Study 2 recruited a separate sample of 154 participants (108 females and 46 males) between the ages of 18 and 56 (mean age = 22.78 years, *SD* = 6.17). Participants were recruited via posters and word of mouth through staff and students of Monash University. All procedures were approved by the University's Standing Committee on Ethics in Research in Humans. Demographics of this second sample are also presented in Table 1.

MATERIALS

Measure of music engagement. As with Study 1, the MUSE questionnaire was made available online via SurveyMethods (www.surveymethods.com). A shortened version of the Music Engagement Style (MES) scale with 50 items (based on Factor Analysis results from Study 1) was administered. Responses to item statements were made on a 6-point Likert-scale ranging from "0" ("not at all"/"not applicable to me") to "5" ("strongly agree"). The Likert-scale rating was changed from 5-point in Study 1 to 6-point for Study 2 to include the "0" option for individuals who have not engaged with music in the form of the activity described in the item statement.

Measure of music experience. To the best of our knowledge, no other measure assessing the degree of engagement in music reception and production activities existed. In order to establish validity of the MUSE questionnaire, the subscales were compared with the brief version of the Music Experience Questionnaire (MEQ; Werner et al., 2006). The brief MEQ was developed with a sample of college students and assesses aspects of self-reported music experience via 53 items, rated on a 5-point scale ranging from "1" ("very untrue") to "5" ("very true"). The instrument comprises six subscales: "Innovative Musical Aptitude" is a self-reported measure of musical performance ability and the individual's ability to generate or create musical themes, "Commitment to Music" relates to the pursuit of musical experiences in the individual's life, "Social Uplift" relates to the experience of being stirred and uplifted in a group setting by music, "Affective Reactions" relates to an individual's affective and spiritual reactions to music, "Positive Psychotropic Effects" relates to an individual's state of mental reactions, and "Reactive Musical Behavior" relates to an individual's physical reactions to music. This instrument has good internal consistency (alpha ranged from .74 to .89) for all subscales except "Social Uplift," which was reported by Werner et al. (2006) as .62. Further, factor analyses demonstrate the subscales can be grouped under two primary factors: "Subjective/Physical Reactions" (Affective Reactions, Positive Psychotropic Effects, and Reactive Musical Behavior) and "Active Involvement" (Commitment to Music, Innovative Musical Aptitude, Positive Psychotropic Effects, and Social Uplift).

Measure of self-regulatory styles. MES-I reflects a combination of uses of music for cognitive and emotional self-regulatory purposes. To check validity of MES-I, as well as explore the relationship between the various styles of music engagement and the individual's emotion regulation style, we used the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), a 10-item scale, rated on a 7-point scale ranging from "1" ("strongly disagree") to "7" ("strongly agree"). ERQ contains two subscales for emotion regulatory strategies, where "Reappraisal" is the cognitive reinterpretation of information eliciting emotions and "Suppression" is the inhibition of emotional expression.

PROCEDURE

After agreeing to participate in this study, participants were provided with the link to the website, where they provided informed consent and completed the online questionnaire. Participants took about 30 min to complete the revised Music use questionnaire, brief MEQ, and ERQ.

Results and Discussion

FACTOR STRUCTURE OF THE MES SCALE IN STUDY 2 (N = 154)

For Study 2, an exploratory factor analysis using maximum likelihood extraction was conducted on the 50 items.

The KMO measure verified the sampling adequacy for this analysis, KMO = .76, and a significant Bartlett's test of sphericity χ^2 (1225) = 3426.62, $p < .001$, indicated that correlations between items were sufficiently large for factor analysis. Based on the scree plot and Horn's parallel analysis (Thompson, 2004), we retained five factors,[3] which in combination explained 32.71% of the variance (see Table 6 for variance of each factor).

The 50-item scale provides a comprehensive assessment of music engagement and it is advised that this version be used in full where differentiating types of music engagement is central to the research question. However, it was also acknowledged that as an alternative to traditional measures of musicianship (such as years of music training), a 50-item scale may be too long. An effort was therefore made to reduce the number of items while retaining the breadth and explanatory power of the 50-item MES scale. In this scale refinement phase of analyses, the same set of criteria for item selection from Study 1 was used. In addition, the item loading cut-off criterion was increased to .50 to yield cleaner factors, as more liberal criteria yielded factors with mixed items (particularly one factor consisting of many reverse-scored items, which previous research has indicated can be confusing for participants). The alpha reliability coefficients for this second sample are in Table 6.

[3] Horn's parallel analysis suggested retaining six factors, which in combination explained 36.85% of the variance. However, the fifth factor of the initial 6-factor model contained reverse-worded items, incongruent with other item descriptions. Furthermore, the reverse-worded items did not meet the item selection criteria, and were deleted. Loading of items in Dance and Physical Exercise was divided onto two different factors in Study 2, with items representing an individual's use of music for physical health purposes in one factor, and engagement with music through dance in another factor.

Based on these criteria, 24 items were retained in Study 2. The five factors displayed sound reliability with alpha coefficients ranging from .78 to .87 ($M = .82$). The factor loadings of the 24-item Music Engagement Style scale (with the corresponding item number used in Study 2) are provided in the Appendix. This shortened version still retained items from the matrix of both aspects of music production and reception, by each of the previously identified functions of music (cognitive, emotional, social, and physical), and therefore was considered to be a good reflection of the full MUSE. While this version yields three factors with 2 or 3 items, all three scales retain sound reliability, although it is advised that researchers interested in these scales either utilize the full MUSE or confirm this factor structure in their own data sets. Importantly, the same factors emerged in each study, despite considerable differences in the mean age of the two samples, suggesting the MUSE may be generalizable across age groups.

RELATIONSHIPS BETWEEN MUSIC ENGAGEMENT STYLES AND INDICES

Pearson correlations between the music engagement styles, the three indices, years of training, and measures of ERQ are presented in Table 7.

As with the first study, the Index of Music Training (IMT) correlated positively with the music production Index of Music Instrument Playing (IMIP), MES-II (Engaged Production), and years of training. Similar associations exist for Index of Music Instrument Playing. Of particular interest is the positive association between the Index of Music Listening, MES-I (Cognitive and Emotional Regulation), MES-III (Social Connection), MES-IV (Physical exercise), and MES-V (Dance) with ERQ Reappraisal. These results support previous studies that found that individuals listen to music for the

TABLE 6. Variance and Alpha Reliability Coefficients of the Music Engagement Styles

	Study 2 ($N = 154$)			
	% of variance			
Music Engagement Style (MES)	Before rotation	After rotation	Cronbach's Alpha	Number of items
MES-I Cognitive & Emotional Regulation	17.77	9.54	.83	7
MES-II Engaged Production	9.15	9.10	.87	9
MES-III Social Connection	6.53	5.62	.79	3
MES-IV Physical Exercise	4.85	4.40	.78	3
MES-V Dance	3.62	4.05	.81	2

TABLE 7. Correlations Between Music Engagement Styles, Indices, YoT and ERQ

	MES-I	MES-II	MES-III	MES-IV	MES-V	IML	IMT	IMIP	YoT	ERQ-R
MES-II	.15	1								
MES-III	.31**	.26**	1							
MES-IV	.21*	.00	.10	1						
MES-V	.17*	.04	.04	.37**	1					
IML	.39**	.09	.13	.05	.06	1				
IMT	-.14	.41**	.12	-.02	-.07	-.04	1			
IMIP	-.07	.32**	.07	-.18*	-.04	.15	.35**	1		
YoT	-.11	.36**	.15	-.08	-.11	.04	.76**	.45**	1	
ERQ-R	.45**	.01	.16*	.18*	.23**	.24**	.05	.10	-.05	1
ERQ-S	-.10	.11	.02	.17*	-.04	-.10	.04	-.01	.03	-.11

Note: MES-I: Cognitive & Emotional Regulation; MES-II: Engaged Production; MES-III: Social Connection; MES-IV: Physical Exercise; MES-V: Dance; IML: Index of Music Listening; IMT: Index of Music Training; IMIP: Index of Music Instrument Playing; YoT: Years of training; ERQ-R: ERQ Reappraisal; ERQ-S: ERQ Suppression; * $p < .05$, ** $p < .01$

purposes of maintaining or enhancing one's cognitive or emotional state and relations with others, as well as for using music as an accompaniment to dance or exercise routines (Chamorro-Premuzic & Furnham, 2007; North et al., 2000).

Partial correlations were also used to assess the linear relationship between engaged production (MES-II) and music instrument playing (IMIP) in this second sample after controlling for years of training. As with Study 1, the partial correlation was statistically significant, $r(151) = .20$, $p = .016$. After controlling for years of training, 4% of the variability in music instrument playing could still be accounted for by the quality of one's engagement with music. These results suggest that an individual's level of music instrument playing is not only associated with the years of music training, but also a range of other reasons (as measured by MES-II). The strong correlations between MES-II and the two indices of music training and instrument playing in both samples demonstrate support for content and criterion validity of this style of engagement. These music production indices of the MUSE questionnaire are positively correlated with the years of music training, a commonly used measure of musicianship.

ASSOCIATIONS BETWEEN MUSIC ENGAGEMENT STYLES AND BRIEF MEQ

Correlations between the music engagement styles of the MUSE questionnaire and measures of brief MEQ are presented in Table 8.

MES-I was positively correlated with all subscales of the brief MEQ. While such a broad association with the brief MEQ subscales was not expected, this finding suggests that individuals using music for emotional and cognitive regulation report being both actively involved with music and subjectively and physically responsive to it. Importantly, MES-I was more strongly associated with the subscales loading on the brief MEQ factor "Subjective/Physical Reactions" than the "Active Involvement" factor, which may reflect a predominantly receptive bias in engagement with music. In contrast, MES-II was positively correlated with the subscales of "Commitment to Music," "Innovative Musical Aptitude," and "Positive Psychotropic Effects." These factors all load on the brief MEQ factor "active involvement," which validates the conceptualization of MES-II as "Engaged Production." These data also suggest that individuals who are highly engaged in the production of music may be less physically and subjectively responsive to music, and instead engage in a predominantly "active," rather

TABLE 8. Correlations Between Music Engagement Styles and brief MEQ

	MES-I	MES-II	MES-III	MES-IV	MES-V
Brief MEQ-Commitment	.28**	.42**	.31**	.01	.01
Brief MEQ-Innovative	.19*	.64**	.27**	-.05	-.03
Brief MEQ-Social	.47**	.16	.29**	.22**	.26**
Brief MEQ-Affective	.47**	.06	.15	-.03	-.03
Brief MEQ-Psychotropic	.57**	.27**	.48**	.17*	.16
Brief MEQ-Reactive	.55**	.10	.11	.14	.38**

Note: MES-I: Cognitive & Emotional Regulation; MES-II: Engaged Production; MES-III: Social Connection; MES-IV: Physical Exercise; MES-V: Dance; * $p < .05$, ** $p < .01$

than responsive, way with music. It was interesting to observe that individuals with high levels of such music experiences also indicated high levels of active engagement with music production. Similar associations are present for these three subscales and MES-III. In addition, another subscale of the brief MEQ, "Social Uplift," is also positively correlated with MES-III. This provided evidence for the scale's validity -- that favorable group-oriented music experiences are associated with active engagement of music to facilitate social environments. MES-IV was positively correlated with "Social Uplift" and "Positive Psychotropic Effects," while MES-V was positively correlated with "Social Uplift" and "Reactive Musical Behavior." This final subscale of the brief MEQ describes self-reported experiences of motile reactions to music. Its significant association with MES-V, and not MES-IV, further strengthens the differentiation between the two ways of physically engaging with music, through physical exercise or dance. Even though MUSE questionnaire does not assess or provide the individual's technical musical ability, the significant associations with broad-based measure of music experiences such as the brief MEQ clearly demonstrates the importance of having a measure of active music engagement.

RELATIONSHIPS BETWEEN GENDER, EDUCATIONAL LEVEL, EMPLOYMENT, INCOME AND MUSIC ENGAGEMENT

Spearman's correlation was performed to examine the relationship between the demographic variables and each of the MES subscales (see Table 9).

Females were more likely to engage with music for MES-V (Dance). In contrast to Study 1, there were positive correlations between MES-III and both education level and employment status. Further, employment status was also significantly associated with a greater likelihood of engaging with music for the purposes of physical exercise. Annual household income was also positively correlated with this style of music engagement.

TABLE 9. Correlations Between Music Engagement Styles, and Demographic Variables

	MES-I	MES-II	MES-III	MES-IV	MES-V
Gender#	.14	-.09	.06	.15	.33**
Education	-.14	.05	.20*	.02	-.15
Employment	-.12	-.08	.16*	.20*	-.13
Annual household income	-.15	-.03	.08	.27**	-.06

#Gender: males = 1, females = 2.
Note: MES-I: Cognitive & Emotional Regulation; MES-II: Engaged Production; MES-III: Social Connection; MES-IV: Physical Exercise; MES-V: Dance; * $p < .05$, ** $p < .01$

General Discussion

The MUSE questionnaire introduced in this paper was designed to measure an individual's level of engagement with music. It is firmly grounded in previous theoretical understanding about the ways which individuals use music in their everyday lives. This questionnaire (abbreviated the "MUSE") provides the user with a music engagement profile, as indicated by the three indices and five distinct styles of music engagement. The first Index of Music Training (IMT) captures an individual's music background, as assessed by the highest level of formal music training, other types of informal music training, and completion of certified examinations. The

second Index of Music Instrument Playing (IMIP) assesses the intensity of practice, measured by the duration and frequency, as well as the regularity of instrument playing. The third Index of Music Listening (IML) assesses the intensity of music listening, measured by the weekly frequency and daily duration of intentional music listening. A revised 24-item scale assessed the five distinct styles of Music Engagement. Initial evidence for this scale's reliability and validity was obtained. With this music engagement profile, researchers will be able to capture the complete music background of an individual in a brief 5-min self-response questionnaire.

Individuals vary widely in the level of sophistication to which they develop their music ability. Apart from professional musicians who engage in highly intense practice daily, and have acquired highly precise performing abilities, the vast majority of people have acquired a common receptive musical ability, regardless of having received any formal music education or training (Peretz & Zatorre, 2005; Sloboda, 2005). Categorizing professional musicians with undergraduate music majors or individuals who have had a few years of music training as musicians may be misleading, as it suggests that these individuals represent a uniform population of musicians (Margulis, 2008). Nor is utilizing mean number of years of formal music training as a measure of musicianship, as it does not take into account one's level of engagement with other music activities apart from music education or performance training. We argue here that a more continuous and multidimensional measure of music engagement may provide greater explanatory power and application of music research findings. Our data indicate that individuals' engagement with music can be described on at least five distinct styles, ranging from self-regulatory purposes to music performance-based activities and using music to facilitate social interaction, physical exercise and dance.

Factor analyses conducted in Study 1 clearly differentiated the four styles of music engagement: MES-I being Cognitive and Emotional Regulation, MES-II being Engaged Production, MES-III being Social Connection, and MES-IV being Dance and Physical Exercise. Music Engagement Styles I, III, and IV support previous findings that individuals use music for cognitive, affective, social, and physical purposes (DeNora, 2000; Hargreaves & North, 1999; Sloboda et al., 2001). In addition, these results suggest that individuals also engage with music for mastery of improvisation or instrument playing. It has been suggested that individuals proficient in music production may be more likely to engage with music in an analytical way; that is, focusing on the musical structure rather than the emotional content (Chamorro-Premuzic & Furnham, 2007; Kreutz et al., 2008). However, no distinct factor emerged for an intellectual or analytical style of music engagement from our data. While items were initially included to capture this construct (e.g., "Complex pieces of music excite me," "Variations on a piece of music I know fascinate me," "I analyze the instrumentation in music compositions"), none of these items loaded significantly on any factor. This may reflect the substantial proportion of musically naïve participants in our samples, and it would be valuable to replicate the initial study with the full 124-item set in an extended sample. Cognitive regulatory functions of music use were nonetheless reflected in the first factor of the MES scale (MES-I).

MES-I ("Cognitive and Emotional Regulation") accounted for nearly 20% of the variance in Study 1 and 10% in Study 2. High scores for MES-I indicate a greater likelihood of individuals engaging with music to bring about desired level of cognitive performance or emotional state. Interestingly, all seven items of this engagement style were theoretically developed to assess the receptive process of music engagement. This style of music engagement is consistent with previous studies, which found that individuals use music to achieve optimum levels of cognitive stimulation (Kreutz et al., 2008) and for regulation of emotions (Chamorro-Premuzic & Furnham, 2007).

The initial pool of items was developed based on previously established processes and functions of music. Prior to rotation, factor analyses demonstrated two main ways of how individuals process music. Intriguingly, upon rotation, rather than engaging with music for distinct purposes of cognitive or emotional regulation, both samples indicated a combined style of engagement. More extensive analyses with larger sample sizes may yield evidence of further differentiation of this factor, as suggested by the literature. This finding is nonetheless in line with increasing trends to take an integrative approach towards both cognition and emotion (Lazarus, 1984; Scherer, 2003), rather than viewing them as distinct experiences. Flavell (1987) described the "metacognitive experience" as one that encompasses both affective and cognitive experiences, and music can be viewed as one such highly engaging experience. It comes as no surprise then that, the Index of Music Listening, as well as MES-I, III, IV, and V were positively correlated with the "Reappraisal" subscale of the ERQ (Gross & John, 2003). These results suggest that high levels of music engagement and listening are associated with favorable and adaptive self-regulatory strategies, in support of previous research that cites

music listening as a popular strategy to enhance hedonia and emotion regulation (Miranda & Claes, 2009; Saarikallio & Erkkilä, 2007). This finding has exciting implications for future research investigating the benefits of music engagement on well-being. Further validity testing using other meaningful criteria variables will be required.

Furthermore, an absence of correlation between music listening and engagement with the "Suppression" subscale of the ERQ (Gross & John, 2003) was observed in this sample. Suppression is described as a response-focused strategy (Gross & John, 2003) that inhibits emotional expression and may be viewed as a maladaptive strategy. The absence of association could suggest that individuals highly engaged in both music reception and production use music as a platform to effectively express their emotions.

In contrast, MES-II ("Engaged Production"), IMT, and IMIP were not correlated with either subscale of the ERQ, suggesting that music production is not used for emotion regulation purposes. MES-II accounted for approximately 15% and 9% of the variance, in Study 1 and 2 respectively. This style of music engagement reflects a self-evaluated quality in one's music production. Engaged Production refers to the extent to which individuals engage with music production for mastery of improvisation or playing skills. Scores on this factor would be an indication of the level of active pursuit of skill mastery. As with MES-I, all nine items of MES-II were theoretically developed to assess the quality and importance of music playing to the individual. The emergence of this as a distinct style of music engagement captures aspects of quality rather than quantity, of musicianship described by Elliott (1995), differentiating the novice, competent or expert musician. For instance, the expert musician would have fully developed and integrated "procedural, formal, informal, impressionistic, and supervisory musical knowledge" Elliott (1995, p. 71), as compared with the competent individual, who has proceduralized their knowledge of musical works, but is yet able to deliberately seek out opportunities to engage with the musical works at a higher level.

MES-III ("Social Connection") and MES-IV ("Dance and Physical Exercise") accounted for a small amount of variance (between 6-8% and 4% respectively). MES-III assesses the extent to which an individual is likely to engage with music for the purposes of seeking or improving social relationships. Its emergence as a factor in this study is consistent with reports of individuals using music as construction and presentation of self (Green, 1999), to form social groups (North & Hargreaves, 2007), and to share significant experiences with others (Cunningham et al., 2004). MES-IV (in Study 1) assesses the extent to which individuals engage with music for artistic, physical exercise, and health purposes. High scores on this style of engagement would indicate that the individual actively uses music to express himself or herself through dance or to enhance endurance during exercise. This style of music engagement was further differentiated in the second sample, with MES-IV ("Physical Exercise") accounting for 4.40% of variance and MES-V ("Dance") accounting for 4.05% of variance. In Study 2, females indicated a greater likelihood to engage with music via this style. This is in line with previous findings of high levels of engagement with dance, particularly among females (Wells, 1990). Despite the potential wide-ranging benefits of dance on health, and the social importance of music in people's lives, these styles of music engagement have been largely overlooked in previous research. The MUSE offers researchers a resource to identify each individual's unique profile of music engagement, which may provide greater insight into what types of music activities are beneficial for mental health and well-being.

Despite growing criticisms of an over-simplistic quantitative measure of exposure duration, "years of music training" is still often used as the only indication of an individual's level of music engagement (Gjerdingen, 2003; Margulis, 2008). Partial correlations from both studies suggest that after controlling for years of training, the likelihood of an individual engaging with music instrument playing could be further accounted for by the quality of a person's engagement with music. Even though the relationship is diminished, the unique effect of an individual's level of active engagement through MES-II highlights the important role of active engagement, and not just music training or music instrument playing. Further, the absence of correlation – in both samples – between years of training with music reception measures such as MES-I, III, IV, V, and the Index of Music Listening could imply that a high level of music engagement is independent of the traditional notion of musicianship. However, this possibility needs to be further evaluated in future research.

In conclusion, this study provides a reliable and valid tool for measuring an individual's level of active engagement with music. The MUSE questionnaire is a novel measure incorporating quality and quantity indices of both music production and music reception. The important role music plays in our lives warrants further investigation of the various aspects of music engagement. The impact of music on emotional,

mental, and physical well-being is significant, and the development of MUSE provides a useful tool in the exploration of the effects of music engagement. In addition, the MUSE is recommended to researchers as a continuous construct alternative to dichotomization of musicianship.

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APPENDIX. Items of MUSE questionnaire for Study 2

Index of Music Listening (IML)	
1.	On average, how often do you listen to music in a week?
2.	On average, how many hours do you purposely listen to music a day?
Index of Music Instrument Playing (IMIP)	
3.	Have you played / do you play a music instrument?
4.	At the peak of your interest, how many hours per day did you play / practise the music instrument?
5.	How long since you last regularly played a music instrument?
Index of Music Training (IMT)	
6.	What is the highest level of formal music training you have received?
7.	What other type of music training did you receive?
8.	Have you completed AMEB (or equivalent such as ABRSM) music examinations?

Item Number	Item description	Factor loadings
Music Engagement Style – I (Cognitive and Emotional Regulation)		
Item 41	I often listen to music when I'm feeling down	.82
Item 42	Specific types of music make me feel better	.78
Item 3	Music often takes away tension at the end of the day	.58
Item 4	I often listen to new compositions	.58
Item 47	I use a particular type of music to get me through tough times	.58
Item 2	Music is often a source of inspiration for me	.57
Item 14	Certain types of music help me think	.53
Music Engagement Style – II (Engaged Production)		
Item 28	Mastering a piece of music gives me greater recognition as a performer	.86
Item 12	I often play challenging pieces	.70
Item 49	Practice helps me improve my music playing skills	.67
Item 16	Performing music is emotionally rewarding for me	.67
Item 36	I often get recognition from my friends for playing in a group	.62
Item 18	I often look forward to attending music practices with my friends	.61
Item 43	Being able to improvise whilst playing music gives me a great sense of satisfaction	.61
Item 5	Music performance demonstrates my knowledge of music theory	.54
Item 1	I feel good when my performance is applauded	.53
Music Engagement Style – III (Social Connection)		
Item 25	Having a similar taste in music often helps me relate better to my peers	.77
Item 32	I am able to make more friends when we like the same type of music	.76
Item 8	There is a greater connection with my friends when we like the same music	.67
Music Engagement Style – IV (Physical Exercise)		
Item 29	Listening to music whilst exercising often helps me exercise for longer	.82
Item 38	Music improves my physical endurance level	.65
Item 7	Music provides me with a good pace for exercising	.64
Music Engagement Style – V (Dance)		
Item 30	Dancing keeps me fit	.82
Item 9	Dance is an expression of my feelings	.78

Note: Responses for 24-item Music Engagement Style scale are made on a 6-point Likert-scale ranging from "0" (Not at all/Not applicable to me) to "5" (Strongly agree). Both the 32- and 58-item MUSE questionnaires are available from the authors.