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## **The relationship between musical preferences and Type D personality**

Yu-Chi Chung, Alinka E. Greasley & Li-Yu Hu

### **Abstract**

Emotion regulation is one of the main reasons that people listen to music, and personality traits have been shown to exert significant influence in shaping musical preferences. Type D personality is a psychological risk factor for adverse health outcomes. However, no music studies have yet examined the effect of Type D personality on musical preferences, which may provide some preliminary insight into clinical applications. Therefore, this study investigated the relationship between Type D personality and musical preferences. An online survey investigating musical preferences (Revised version of the Short Test of Musical Preferences [STOMP-R]) and the Type D personality was administered. In total, 196 participants completed the survey, of which half were from the Eastern culture and half from the Western culture. 40% of the participants were categorised as Type D personality, and no significant association of gender or nationality with Type D classification was observed. However, the links between Type D personality and the Punk genre ( $p=.047$ ), and between non-Type D personality and the Jazz genre ( $p=.008$ ) were indicated. Moreover, differences were observed in the factor structure of STOMP-R. The exploratory results facilitate the understanding of links between personality traits and music listening and provide new insight into musical preference dimensions.

### **Keywords**

*Type D personality, musical preferences, mental health, musical dimensions, cross-cultural*

Regulation of emotions is one of the main reasons that people listen to music (Saarikallio, 2011; Sloboda, 2011; Thoma, Ryf, Mohiyeddini, Ehlert, & Nater, 2012), and mood improvement has been indicated as the most common benefit that people perceive while listening to their favourite music (Schafer & Sedlmeier, 2009). Moreover, factors affecting people's preferences in choosing music have been investigated (Dunn, de Ruyter, & Bouwhuis, 2011; Liljestrom, Juslin, & Vastfjall, 2012; Schäfer & Sedlmeier, 2010; Schafer & Sedlmeier, 2009; Schafer, Tipandjan, & Sedlmeier, 2012). In particular, the role of personality traits in shaping musical preferences has received the most attention in the music psychology literature (Bonneville-Roussy, Rentfrow, Xu, & Potter, 2013; Delsing, Bogt, Engels, & Meeus, 2008; Getz, Marks, & Roy, 2012; Rentfrow & Gosling, 2003). However, studies conducted in the field of music psychology have primarily focused on the five-factor model (FFM) or Big Five personality traits (Bonneville-Roussy et al., 2013; Rentfrow & Gosling, 2003) and additional studies on other personality traits affecting musical preferences are required.

Compared with the FFM, Type D personality might be a novel personality trait studied in the field of music psychology and initially applied in clinical settings (Denollet, Sys, & Brutsaert, 1995). According to Denollet, Type D personality has a propensity towards distress and is defined as a combination of negative affectivity (NA) and social inhibition (SI); individuals with a tendency to experience negative emotions (e.g. dysphoria and anxiety) and inhibit self-expression in social interactions simultaneously are classified as Type D personality (Denollet, 2005; Denollet, Schiffer, & Spek, 2010; Denollet et al., 1995; Denollet et al., 1996). This personality construct has been regarded as a potential risk factor for adverse health outcomes (Mols & Denollet, 2010; Nefs et al., 2015; Pedersen et al., 2007; Schiffer, Smith,

Pedersen, Widdershoven, & Denollet, 2010) however, no studies have investigated the relationship between Type D personality and musical preferences. Therefore, this study investigated the relationship between Type D personality and musical preferences, which may facilitate the understanding of the effect of personality traits on music listening and provide some preliminary insights into clinical applications. Moreover, we have reviewed and discussed empirical studies reporting the association of musical preferences with personality traits in this study. Furthermore, the application of Type D personality in clinical and general settings has been addressed to gain a better understanding of the effect of this construct on general health outcomes. On the basis of previous literature, hypotheses regarding the relationship between musical preferences and Type D personality have been proposed.

Numerous possible factors may determine musical preferences, including musical styles (e.g. classical and jazz), musical characteristics (e.g. energy levels), listener characteristics (e.g. personality traits, age, and gender), and situational and contextual factors (e.g. cultural contexts; Greasley & Lamont, 2016). Among these factors, the role of personality traits in shaping musical preferences has been emphasised in the music psychology literature (Bonneville-Roussy et al., 2013; Dunn et al., 2011; Rentfrow, Goldberg, & Levitin, 2011; Rentfrow & Gosling, 2003; Zweigenhaft, 2008). FFM was commonly assessed to investigate the effect of personality traits on music listening (Bonneville-Roussy et al., 2013; Dunn et al., 2011; George, Stickle, Rachid, & Wopnford, 2007; Vuoskoski & Eerola, 2011). Although musical dimensions have been assessed and classified using different methodological approaches, some similar patterns have been found between FFM and musical dimensions (Greasley & Lamont, 2016). A representative online survey study revealed the specific association of FFM with five musical dimensions among nearly 255,000 participants from the United Kingdom and the United States (Bonneville-

Roussy et al., 2013). Factor analyses of musical genre ratings using the STOMP-R resulted in a five musical preference dimensions which the authors described as the 'MUSIC' model, with each letter indicating a factor. Results indicated that openness was positively linked to preferences for *Mellow* (e.g., Electronica, New Age), *Sophisticated* (e.g., Jazz, Classical), and *Intense* (e.g., Rock, Punk); conscientiousness was positively linked to preferences for *Unpretentious* (e.g., Pop, Country) but negatively linked to *Intense*; extraversion was positively linked to preferences for *Unpretentious* and *Contemporary* (e.g., Rap, R&B); and agreeableness was positively linked to preferences for *Unpretentious*.

Similar results have been reported for the relationship between FFM and musical preferences in earlier studies. For example, openness was positively linked to preferences for *Rock* and *Intense*; extraversion was positively linked to *Urban*; and conscientiousness was positively linked to *Elite* but negatively linked to *Rock*. (Delsing et al., 2008; George et al., 2007; Rentfrow & Gosling, 2003). However, these studies have yielded inconsistent results, such as emotional stability (opposite to neuroticism) was negatively linked to *Elite* (Delsing et al., 2008) but positively linked to *Reflective/Complex* (Rentfrow & Gosling, 2003). Moreover, no association was reported between the trait of neuroticism/emotional stability and any specific music dimensions of the MUSIC model (Bonneville-Roussy et al., 2013). In addition, extraversion was positively linked to *Pop/Dance* (Delsing et al., 2008); however, Bonneville-Roussy et al. did not observe the association of extraversion with preferences for *Mellow* (Bonneville-Roussy et al., 2013). Therefore, because of the inconsistent results, more studies are required to confirm the relationship between FFM and musical preferences.

A relationship between musical preferences and other personality traits including optimism and hostility has been reported (George et al., 2007; Getz et al., 2012). A

study reported that hostility was positively linked to preferences for *Rebellious* and *Rhythmic & Intense* (George et al., 2007). Moreover, compared with less optimistic individuals, optimistic individuals tended to highly enjoy *Upbeat/Conventional* music (Getz et al., 2012).

In summary, whilst there are some consistent links between personality traits and liking for particular styles, such as the link between extraversion and preference for highly arousing forms of music, studies investigating the relationship between preferences and personality traits have revealed inconsistent results. Furthermore, the majority of existing music studies have focused on the relationship between the FFM and musical preferences, and the inclusion of other personality traits in music studies is scarce. Therefore, revalidating the relationship between musical preferences and personality traits and building on the literature by including alternative personality constructs in music studies is imperative.

Type D personality is the combination of NA and SI (Denollet, 2005). This personality construct is different from the clinical diagnosis of depression, and most Type D individuals do not meet the specified diagnostic criteria for depression (Denollet et al., 2009; Michal, Wiltink, Grande, Beutel, & Braehler, 2011).

Associations among NA, SI, and FFM have been reported. In Denollet's study (2005), 135 cardiac patients and 140 participants from the general population completed the questionnaire assessing Type D personality and FFM. The results revealed that NA was positively correlated with neuroticism in the cardiac patients, whereas SI was negatively correlated with extraversion in the general participants, confirming the tendency of Type D individuals to present more emotional instability and display increased shyness symptoms during social interactions. Another study (Williams et al., 2008) evaluating data from 1,012 healthy college students reported that Type D personality was linked to high levels of neuroticism.

Accumulating evidence has emphasised the importance of Type D personality as a psychological risk factor for various adverse health outcomes (Conden, Leppert, Ekselius, & Aslund, 2013; Denollet et al., 2010; Mols, Thong, van de Poll-Franse, Roukema, & Denollet, 2012; Williams et al., 2008) . An evidence-based review of Type D personality and prognosis in cardiac patients revealed the association of Type D personality with an increased risk of adverse cardiac events (e.g. myocardial infarction) and emotional distress including depressive symptoms and anxiety (Denollet et al., 2010). In addition, Type D personality has been associated with poor quality of life, poor disease management, increased fatigue, and poor emotional and social functions in clinical samples (Mols et al., 2012; Nefs et al., 2015; Son, You, & Song, 2012).

In nonclinical samples, Type D personality has been associated with clinically significant mental distress (e.g. depression and panic), low levels of perceived social support, low locus of health control, unhealthy behaviours, alcohol abuse, psychosomatic symptoms, musculoskeletal pain, and possible adverse outcomes related to cardiovascular functions (Conden et al., 2013; Martin et al., 2010; Michal et al., 2011; Williams et al., 2008). A population-based study including 5,012 adolescents reported a strong relationship among Type D personality, psychosomatic symptoms, and musculoskeletal pain, in which Type D adolescents were prone to report more musculoskeletal pain and psychosomatic symptoms with approximately 2-fold and 5-fold increased odds, respectively (Conden et al., 2013). Moreover, in a study including 1,012 young adults, Type D participants reported lower levels of perceived social support and more unhealthy behaviours than non-Type D participants did, including less sense of diet, spending less time outdoors, and irregular medical check-ups (Williams et al., 2008).

These studies indicate a negative effect of Type D personality on general health

outcomes. As music listening plays a key role in regulating people's emotions, investigating the relationship between Type D personality and musical preferences might provide a preliminary insight on the regulation of emotions by Type D individuals which could potentially be applied in the clinical practice of music selection.

This study investigated the relationship between Type D personality and musical preferences. On the basis of previous studies, we predicted differences in musical preferences based on Type D classification, particularly in music genres such as *Unpretentious*, *Contemporary* (Bonneville-Roussy et al., 2013), and *Elite* (Delsing et al., 2008). The predictions were on the basis of the preliminary evidence that NA was positively correlated with neuroticism (Denollet, 2005), whereas emotional stability (opposite to Neuroticism) was negatively linked to *Elite* (Delsing et al., 2008); and SI was negatively correlated with extraversion (Denollet, 2005), whereas extraversion was positively linked to *Unpretentious* and *Contemporary* (Bonneville-Roussy et al., 2013). Moreover, this preliminary study re-explored musical preference dimensions in the revised version of the Short Test of Musical Preferences (STOMP-R; Bonneville-Roussy et al., 2013).

## **Methods**

An online survey for assessing musical preferences and Type D personality was developed. The study was approved by the University of Leeds Research Ethics Committee (LTMUSC-038), and participants provided electronic informed consent for their voluntary participation.

### *Participants*

There were no exclusion criteria for participating in the online survey; anyone with a



basic English language proficiency could participate. In total, 215 participants were recruited through social media (e.g., acquaintances' Facebook post) or email invitation from the school office, and the participants anonymously completed the online survey over the Internet between April and June in 2015. Of these, 76 (35.3%) were male, 137 (63.7%) were female, and 2 (0.9 %) reported another gender. Participants' ages ranged from 18 to 66 years ( $M = 28.2$ ,  $SD = 8.49$ ). In terms of ethnicity, 110 (51%) were Asians, 2 (1%) were Africans, and 103 (48%) were Europeans or Americans. Of the 215 participants, 19 (8.8 %) were excluded from the analysis because of incompleteness of the online survey. Of the 215 participants, 71 (33%) were undergraduate students.

### *Measures*

The participants completed the online survey consisting of 44 items, including demographic variables, a questionnaire on musical background (Greasley & Gardiner, 2015), STOMP-R (Bonneville-Roussy et al., 2013), and the Type D personality Scale-14 (DS14; Denollet, 2005).

Demographic variables included gender, age, and nationality. The following questionnaires were used in this study:

*Questionnaire on musical background.* The questionnaire on musical background (Greasley & Gardiner, 2015) is a 4-item self-report questionnaire designed to obtain information related to musical training. The items included are the types and amount of musical training received (e.g. instrument playing and singing), highest level of music education, self-identified level of musical training, and a brief self-description of training. The first three items are summed to produce a total score as an indication of musical training, with higher scores indicating a higher level of musical training.

*STOMP-R*. The *STOMP-R* is a 21-item self-report measure assessing the liking for 21 musical genres by using a seven-point rating scale (1 = dislike, 7 = like; Bonneville-Roussy et al., 2013). Although the original *STOMP-R* comprises 23 items or genres, two of them (soundtracks and oldies) were removed in this study because the interpretation might be influenced by age (Bonneville-Roussy et al., 2013). Therefore, only the following 21 items or genres were used in this study: Electronica/Dance, World/International, New Age, Pop, Country, Religious, Blues, Jazz, Bluegrass, Folk, Classical, Gospel, Opera, Rock, Punk, Alternative, Heavy Metal, Rap, Soul/R&B, Funk, and Reggae.

*DS 14*. The *DS14* (Denollet, 2005) is a 14-item self-report scale assessing the distressed personality (Type D) by using a five-point rating scale (0 = false, 4 = true). The scale comprises two subscales: NA and SI. Each subscale consists of seven items with scores ranging from 0 to 28 in each scale. Individuals with a score of  $\geq 10$  on both the scales are defined as having Type D personality. The *DS14* has been regarded as a valid and reliable measure with satisfactory internal consistency (Cronbach's  $\alpha = .88/.86$ ) and test-retest reliability over a 3-month period ( $r = .82$  and  $.72$ ) for NA and SI subscales, respectively (Denollet, 2005). In this study, the reliability analysis of *DS14* indicated a high level of internal consistency for NA and SI subscales, with Cronbach's  $\alpha = .87$  and  $.84$ , respectively, suggesting that the use of *DS14* in present samples is applicable and suitable for further analysis.

Data were collected online, and the participants required only 5–10 minutes to complete. Once participants had read the introduction of the online survey and ticked “yes” to consent to participate, a series of questions on demographics, musical background, musical preferences, and personality traits were presented, and the

participants responded to those items by ticking where applicable or typing in the box.

## Results

### *Exploratory factor analysis of STOMP-R*

Factor analysis was initially run to re-explore the musical dimensions for confirming the applicability of the MUSIC model in STOMP-R in the current study (Bonneville-Roussy et al., 2013). Considering that variables with various correlations below .3 in the correlation matrix should be excluded (Field, 2013), six items (Electronica, New Age, Country, Pop, Religious, and Gospel) in STOMP-R were removed from further analysis. Principal axis factor analysis was conducted on the remaining 15 items of STOMP-R with varimax rotation. The Kaiser–Meyer–Olkin (KMO) measure verified the sampling adequacy for the analysis (KMO = .77). An initial analysis was performed to obtain eigenvalues for each factor in the data. The scree plot exhibited inflections that justified retaining either four or six factors. Because Rap and Reggae represented significant cross-loadings in two dimensions of the 4-factor solution, the 6-factor solution was applied in the current study. Six factors had eigenvalues of more than 0.7, and these factors in combination accounted for 73.02% of the variance.

The factor loadings after rotation are listed in Table 1. The following items clustered on the same factor suggested in the C-MUSIC model: factors 1, 2, 3, 4, 5, and 6 represent the dimensions of *Intense*, *Sophisticated*, *Contemporary*, *Classical*, *Mellow*, and *Uniqueness*, respectively. Compared with the previous MUSIC model (Bonneville-Roussy et al., 2013), Heavy Metal was removed from *Intense* and moved to *Uniqueness* in the current study. In addition, Classical was removed from *Sophisticated* and moved to *Classical* with Opera. Furthermore, Folk was removed from *Sophisticated* and clustered into *Mellow* with World/International. However, Blues, Jazz, and Bluegrass remained in *Sophisticated*; Rock, Punk, and Alternative

remained in *Intense*; and Rap, Soul/R&B, Funk, and Reggae remained in *Contemporary*. A comparison of the MUSIC model (Bonnyville-Roussy et al., 2013) and the current model (C-MUSIC) is presented in Appendix A.

Because factor structures were inconsistent between the MUSIC (Bonnyville-Roussy et al., 2013) and C-MUSIC models and some items of STOMP-R were removed in this study, the use of the C-MUSIC model rather than the MUSIC model was considered more suitable in this study.

To confirm whether items in the C-MUSIC model consistently measure the same construct, an additional reliability analysis for internal consistency was conducted. The *Intense*, *Sophisticated*, *Contemporary*, and *Classical* dimensions of the C-MUSIC model were found to be internally consistent, with Cronbach's  $\alpha$  of .74, .78, .73, and .71, respectively. However, *Mellow* had relatively low but reasonable internal consistency with Cronbach's  $\alpha$  of .59. Finally, the dimension of *Uniqueness* was not analysed because it contained only one genre.

The results of the reliability analysis suggested that the application of the C-MUSIC model was appropriate in the further analysis to examine the relationship between Type D personality and musical preferences.

#### *Results of the online survey according to personality traits*

Table 2 lists the characteristics of the participants in terms of Type D personality classification. In total, 196 participants were included in the analysis, with missing information on age for one participant ( $n = 195$ ). Using the recommended cut-off of 10 on both the scales ( $NA$  and  $SI \geq 10$ ), 40% of the participants (78 of 196) were categorised as Type D. Of the 78 participants, 61.5% were females, 35.9% were males, and 2.6% reported another gender. No significant association of gender,  $X^2(2) = 3.15, p = .208$ , or nationality,  $X^2(2) = 1.59, p = .452$ , with Type D classification was

observed. In addition, no significant association of age with Type D classification,  $t(179.95) = 1.67, p = .096$ , was observed.

Independent t-tests were performed to examine differences in musical training and musical preferences based on Type D classification (Table 2). The levels of musical training did not significantly differ between the Type D and non-Type D participants,  $t(194) = .851, p = .396$ . Among the dimensions of musical preferences, a marginal difference was observed between *Sophisticated* and Type D classification,  $t(194) = 1.880, p = .062$ . In terms of preference ratings for the 21 genres, the non-Type D participants had significantly higher scores in Jazz than did the Type D participants ( $p = .008$ ), whereas the Type D participants had significantly higher scores in Punk than did the non-Type D participants,  $t(194) = -2.001, p = .047$ . In addition, the non-Type D participants tended to score higher in *Classical* and *Blues* than did the Type D participants, approaching significance.

#### *Gender comparisons*

Because only two participants reported their gender as another gender (2 of 196), they were removed from the current analysis, and the remaining 194 participants were included. Gender differences were observed between the dimensions of musical preferences (Table 3). On average, males had significantly higher scores in *Intense* ( $p = .004$ ) and *Contemporary* ( $p = .010$ ) than females, whereas females had higher scores in *Classical* ( $p = .043$ ) and *Mellow* ( $p = .043$ ) than males. Of the 21 genres of musical preferences, males had higher scores in Rock ( $p = .007$ ), Punk ( $p = .001$ ), Heavy Metal ( $p < .001$ ), Rap ( $p < .001$ ), Funk ( $p = .017$ ), and Reggae ( $p = .026$ ), whereas females had higher scores in World/International ( $p = .020$ ) than males.

#### *Age and culture differences*

Age (cut-off point of 30 years) and culture (Western/Eastern) differences were analysed. The results showed that the participants older than 30 years tended to listen to Religious ( $p = .004$ ) and Classical ( $p = .008$ ), whereas those younger than 30 years preferred to listen to Rap ( $p = .004$ ) and Funk ( $p = .007$ ). The results of the cultural analysis indicated that Western participants preferred the dimensions of *Intense* and *Contemporary* ( $p < .05$ ; except the genres of Soul/R&B and Heavy Metal), whereas Eastern participants preferred New Age, Country, and Opera ( $p = .047$ ,  $p = .001$ , and  $p = .041$ , respectively).

## Discussion

This study investigated the relationship between Type D personality and musical preferences. In addition, the musical dimensions of STOMP-R were re-explored in this study. The key findings and further suggestions of this preliminary study are summarised below.

### *Type D personality and musical preferences*

The hypothesis with regard to Type D personality and musical preferences was partially supported. First, our results revealed that compared with the Type D participants, the non-Type D participants preferred listening to the Jazz genre, which contradicted with the previous results (Delsing et al., 2008) that emotional stability was negatively linked to *Elite* (e.g. Jazz and Classical Music). In addition, compared with the non-Type D participants, the Type D participants rated genres within *Sophisticated* in the C-MUSIC model less highly. Moreover, no difference was observed in any genre within *Unpretentious* (Pop, Country, and Religious) or *Contemporary* (Rap, Soul/R&B, Funk, and Reggae) of the MUSIC model based on the Type D classification. However, Bonneville-Roussy et al. (2013) indicated that

extraversion might link to *Unpretentious* and *Contemporary*.

We observed that the Type D participants had less preference for Jazz but more preference for Punk. These findings might be explained by the musical attributes proposed by Rentfrow and Gosling (Rentfrow & Gosling, 2003). Jazz belongs to the dimension of Reflective/Complex, a dimension related to acoustic and slower tempo music. Thus, it can be assumed that the Type D participants did not prefer listening to acoustic and slower tempo music, which is also in line with the finding of another study that reported that the Type D participants were less likely to choose *Sophisticated* (a dimension that seems to be related to acoustic and slower tempo in the C-MUSIC model). In contrast to Jazz, the Punk genre belonged to *Intense* in this study. Stemming from the perspective of mood regulation through music listening, suppressed hostility might potentially influence music choices in Type D participants. Because previous studies have indicated that Type D individuals reported higher levels of suppressed hostility (Denollet, Gidron, Vrints, & Conraads, 2010; Lin et al., 2017), it is plausible that listening to intense music might help Type D individuals to release their negative emotions. However, more evidence of this assumption of the underlying mechanism of emotion regulation in Type D individuals is required.

More interestingly, the high preference of Punk by the Type D participants may also articulate the specificity of the musical attributes of Punk. Because Punk is believed to be a manifestation of transgression and rebellion against society, containment, dominance, and identity (e.g. gender and social identity; Sanders, 2013; Shahan, 2011), it is likely that the Type D participants may put the focus on self rather than group identity. In other words, although Type D individuals are regarded as “socially inhibited” (Denollet, 2005), they in turn may emphasise the individualistic value rather than the collective value. However, more evidence should be provided to confirm this assumption.

*Gender differences in musical preferences*

Our study results suggest that females tend to prefer *Classical* and *Mellow* whereas males tend to prefer *Intense* and *Contemporary* in the C-MUSIC model, which is in accordance with the results of previous studies (Colley, 2008; Nater, Abbruzzese, Krebs, & Ehlert, 2006; North & Hargreaves, 2007), and the patterns of gender differences can be supported by the finding (Colley, 2008) that femininity is associated with light music whereas masculinity is associated with heavy music. However, the results of musical preferences with regard to specific genres and gender differences were inconsistent. Studies have reported that females are more likely to prefer Chart Pop and Pop, whereas males are more likely to prefer Blues and Jazz (Bonneville-Roussy et al., 2013; Colley, 2008); however, no gender differences were observed in the preference of these genres in our study.

*Age and culture differences*

An interesting phenomenon was observed in the differences of musical preferences according to age and culture. We observed that the older participants appeared to prefer religious and classical music, the musical attributes of which are relatively tender and traditional than those of Rap and Funk, which were the preferences of the younger participants. As an additional aspect, the quest of spiritual life probably grows with age due to the contemplation of life and thus influences musical preferences. Furthermore, music tastes appeared to differ among different cultures. The results revealed that the Western participants preferred Intense and Contemporary, the dynamics of which are regarded as more intense and extroverted. By contrast, the Eastern participants preferred more tender and introverted music, such as New Age, Country, and Opera. The introvert–extrovert phenomenon should



be investigated in future studies.

#### *Differences in the musical dimensions of STOMP-R*

Compared with the results of a previous study (Bonneville-Roussy et al., 2013), several differences were noted in musical dimensions. First, 15 genres remained in the current model. Second, two dimensions (*Mellow/Unpretentious*) in the MUSIC model (Bonneville-Roussy et al., 2013) were removed. Moreover, two new dimensions, *Classical* and *Uniqueness*, were added on the basis of the characteristics of genres, which originally belonged to *Sophisticated* and *Intense*, respectively (Bonneville-Roussy et al., 2013). Heavy Metal differed from other genres because of its uniqueness. Previous studies have reported that Heavy Metal was marked because of its heterogeneity and is different from Heavy Rock (Bayer, 2009; Cope, 2010). To address the issues of heterogeneity in Heavy Metal, it was separated from other dimensions in this study. Retaining Heavy Metal as a separate dimension would be meaningful because this genre might have been transformed and changed owing to its development over decades.

#### *Future research on Type D and musical preferences*

To the best of our knowledge, this is the first study to include Type D personality in the investigation of musical preferences. However, our study has several limitations that should be addressed.

First, the perceived understanding of music genres in STOMP-R might vary with individuals therefore influencing the reliability and validity of the online survey. More research would be needed to validate the clusters in the musical dimensions of the C-MUSIC model due to the relatively small sample. Moreover, because the internal consistency of *Mellow* was relatively low (Cronbach's  $\alpha = .59$ ) and only one genre

was included in *Uniqueness*, the explanatory power of the current model is limited. Conducting replication studies for model validation and examining the musical attributes that belonged to each dimension of the C-MUSIC model, as well as exploring the effect of musical attributes on the musical preferences of Type D individuals, would lend strength to the current findings.

Second, the prevalence rate of Type D personality (40%) in the current participants seems to be higher than in previous studies (Denollet, 2005; Grande, Romppel, Glaesmer, Petrowski, & Herrmann-Lingen, 2010). A larger study should be conducted to examine the presence of any underlying differences in preferences. However, the response set of participants and the prevalence rate of depression are also likely to influence this result. It is possible that participants tended to score higher on DS14 in the current study, causing a higher rate of Type D classification. In addition, depressive participants may score higher on DS14 because of their symptoms, in which the patterns of affectivity and social interactions are similar with those of Type D participants. Therefore, the high prevalence rate of Type D classification can be attributable to the high prevalence rate of depression. Nevertheless, the influence of the prevalence rate of depression in the current study is unknown because the prevalence rate of depression was not investigated.

Third, the psychological mechanism by which Type D individuals regulate their emotions through music listening should be further investigated. Although our study results revealed a relationship between Type D personality and musical preferences, the mechanism of emotional regulation by which musical preferences may contribute to Type D individuals' emotional states was not investigated. Evidence has shown that the suppressive hostility of Type D individuals might be an affective pathway in emotional regulation (Denollet et al., 2010; Lin et al., 2017), which may provide an important new insight of Type D individuals in choosing music, particularly for

genres belonging to *Intense*. Additional studies identifying the mediating roles of musical preferences in Type D individuals' emotional regulation are warranted.

Finally, more cross-cultural evidence for musical preferences and Type D personality should be provided. This exploratory study using a mixture of Western and Eastern cultures demonstrated a general pattern of musical preferences across cultures; even the introvert–extrovert phenomenon has been reported in the current study. The results might be weakened by some methodological flaws, such as the limitations of a small sample size and the influences of cultural diversities, therefore further research with a large sample size and which addresses these should be conducted. Cross-cultural differences can complicate the interpretation of the musical preferences of Type D individuals because musical functions and preferences may vary with cultural differences (Greasley & Lamont, 2016). More details regarding the influence of culture on the relationship between musical preferences and Type D personality should be examined.

## **Conclusion**

This is the first study to apply the Type D personality construct in the field of music psychological enquiry. Differences in musical preferences based on Type D classification and new musical dimensions of STOMP-R were discussed, and may facilitate the understanding of the effect of personality traits on music listening in clinical applications. For instance, clinicians that apply music as a therapeutic element can select personality-oriented music according to study results. In addition, the exploratory study provided a broader understanding on music listening patterns across cultures by including participants from both Western and Eastern cultures. Future studies should validate the findings of this study by increasing the sample size and examining cross-cultural differences in the relationship between personality traits and

musical preferences. In addition, the mediating role of suppressive hostility of musical preferences in Type D individuals' emotional regulation should be further identified.

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## Appendix

## Comparisons of two models in STOMP-R

Genres of STOMP-R	MUSIC Model (Bonneville-Roussy et al.,2013)	C-MUSIC Model Current Study
Electronica/Dance*	Mellow	<i>Removed</i>
World/International	Mellow	Mellow
New age*	Mellow	<i>Removed</i>
Pop*	Unpretentious	<i>Removed</i>
Country*	Unpretentious	<i>Removed</i>
Religious*	Unpretentious	<i>Removed</i>
Blues	Sophisticated	Sophisticated
Jazz	Sophisticated	Sophisticated
Bluegrass	Sophisticated	Sophisticated
Folk*	Sophisticated	Mellow
Classical*	Sophisticated	Classical
Gospel*	Sophisticated	<i>Removed</i>
Opera*	Sophisticated	Classical
Rock	Intense	Intense
Punk	Intense	Intense
Alternative	Intense	Intense
Heavy metal*	Intense	Uniqueness
Rap	Contemporary	Contemporary
Soul/R&B	Contemporary	Contemporary
Funk	Contemporary	Contemporary
Reggae	Contemporary	Contemporary

\* Change in the current study

**Table 1** Rotated factor matrix of STOMP-R (15 Items)

Genres	Six Factors (N= 196)					
	Intense	Sophisticated	Contemporary	Classical	Mellow	Uniqueness
Rock	<b>.508</b>	.016	.197	.024	.040	.318
Punk	<b>.779</b>	.040	.221	.024	-.073	.145
Alternative	<b>.692</b>	.106	.147	-.130	.263	.066
Blues	.110	<b>.857</b>	.256	.102	.071	-.048
Jazz	-.069	<b>.675</b>	.207	.139	.147	.008
Bluegrass	.175	<b>.556</b>	.055	.199	.199	.112
Rap	.313	.097	<b>.456</b>	-.103	-.273	.186
Soul/R&B	-.005	.284	<b>.575</b>	.068	-.156	-.166
Funk	.257	.152	<b>.658</b>	-.008	.113	.142
Reggae	.328	.139	<b>.660</b>	.026	.166	.160
Classical	-.058	.135	-.058	<b>.729</b>	.252	.033
Opera	-.004	.153	.045	<b>.710</b>	.052	.033
World/International	-.045	.201	.086	.375	<b>.503</b>	-.056
Folk	.187	.215	-.051	.167	<b>.619</b>	.011
Heavy Metal	.363	.031	.111	.069	-.046	<b>.848</b>
	$\alpha = .74$	$\alpha = .78$	$\alpha = .73$	$\alpha = .71$	$\alpha = .59$	—

Extraction method: principal axis factoring.

Rotation method: varimax with Kaiser normalisation.

Rotation converged in 8 iterations.

**Table 2** Results of the online survey by personality traits

Characteristics	Total sample ( <i>N</i> = 196)	Non-Type D ( <i>n</i> = 118)	Type D ( <i>n</i> = 78)	<i>p</i>
<b>Demographic</b>				
Age ( <i>n</i> = 195)	28.2 (8.5)	29.0 (8.9)	27.0 (7.7)	.096
Gender (female)	125 (64%)	77 (65%)	48 (62%)	.208
Nationality (European or American) <sup>b</sup>	94 (48%)	56 (60%)	38 (40%)	.452
<b>Musical training</b>				
Musical background <sup>a</sup>	8.1 (4.9)	8.3 (5.1)	7.7 (4.6)	.396
<b>STOMP-R (category)</b>				
Intense	4.3 (1.5)	4.2 (1.4)	4.5 (1.5)	.069
Sophisticated	4.8 (1.3)	4.9 (1.3)	4.6 (1.3)	.062
Contemporary	4.2 (1.3)	4.2 (1.4)	4.2 (1.1)	.736
Classical	5.0 (1.5)	5.1 (1.5)	4.8 (1.5)	.074
Mellow	4.8 (1.3)	4.8 (1.4)	5.0 (1.1)	.192
<b>STOMP-R (items)</b>				
Electronica/Dance	4.1 (1.8)	4.2 (1.8)	4.0 (1.8)	.611
World/International	4.8 (1.5)	4.7 (1.6)	5.0 (1.3)	.304
New age	4.0 (1.5)	4.0 (1.6)	4.1 (1.4)	.591
Pop	5.0 (1.7)	5.1 (1.7)	4.9 (1.8)	.311
Country	4.7 (1.7)	4.8 (1.8)	4.5 (1.5)	.322
Religious	3.6 (1.8)	3.5 (1.9)	3.7 (1.6)	.511
Blues	5.1 (1.6)	5.2 (1.6)	4.8 (1.7)	.086
Jazz	5.3 (1.6)	5.5 (1.6)	4.9 (1.7)	.008*
Bluegrass	4.0 (1.4)	4.0 (1.5)	4.0 (1.4)	.887
Folk	4.9 (1.5)	4.8 (1.6)	5.0 (1.5)	.244
Classical	5.5 (1.6)	5.6 (1.6)	5.2 (1.5)	.098
Gospel	4.0 (1.6)	4.0 (1.6)	4.0 (1.6)	.815
Opera	4.5 (1.9)	4.7 (1.9)	4.3 (1.8)	.131
Rock	5.1 (1.7)	5.0 (1.7)	5.2 (1.8)	.452
Punk	3.6 (1.9)	3.4 (1.8)	4.0 (1.9)	.047*
Alternative	4.3 (1.8)	4.1 (1.8)	4.5 (1.9)	.102
Heavy metal	3.0 (1.9)	2.8 (1.9)	3.2 (1.8)	.166
Rap	3.8 (1.8)	3.8 (1.9)	3.8 (1.7)	.954
Soul/R&B	4.9 (1.7)	5.0 (1.8)	4.7 (1.4)	.210
Funk	4.1 (1.6)	4.1 (1.8)	4.1 (1.4)	.944
Reggae	4.0 (1.8)	4.0 (1.9)	4.0 (1.6)	.882

<sup>a</sup>Total score of musical background\**p* < .05 \*\**p* < .01

**Table 3** Results of the online survey by gender

Characteristics	Male ( <i>n</i> = 69)	Female ( <i>n</i> = 125)	<i>p</i>
Musical training			
Musical background <sup>a</sup>	8.6 (5.0)	7.8 (4.9)	.262
STOMP-R (category)			
Intense	4.7 (1.3)	4.1 (1.5)	.004**
Sophisticated	4.7 (1.3)	4.8 (1.3)	.740
Contemporary	4.5 (1.2)	4.0 (1.3)	.010**
Classical	4.7 (1.5)	5.2 (1.5)	.043*
Mellow	4.6 (1.1)	5.0 (1.3)	.043*
STOMP-R (items)			
Electronica/Dance	4.4 (1.6)	4.0 (1.8)	.086
World/International	4.5 (1.3)	5.0 (1.6)	.020*
New age	4.0 (1.4)	4.0 (1.6)	.838
Pop	4.8 (1.7)	5.1 (1.7)	.269
Country	4.5 (1.6)	4.8 (1.8)	.145
Religious	3.5 (1.8)	3.7 (1.8)	.504
Blues	5.1 (1.6)	5.1 (1.6)	.921
Jazz	5.2 (1.6)	5.3 (1.7)	.620
Bluegrass	3.9 (1.3)	4.0 (1.5)	.650
Folk	4.7 (1.4)	5.0 (1.6)	.236
Classical	5.2 (1.6)	5.6 (1.6)	.063
Gospel	3.8 (1.7)	4.2 (1.5)	.081
Opera	4.2 (1.8)	4.7 (1.9)	.085
Rock	5.5 (1.3)	4.8 (1.9)	.007**
Punk	4.2 (1.8)	3.3 (1.9)	.001**
Alternative	4.5 (1.6)	4.1 (1.9)	.176
Heavy metal	3.6 (1.8)	2.6 (1.8)	< .001**
Rap	4.4 (1.7)	3.4 (1.8)	< .001**
Soul/R&B	4.8 (1.5)	5.0 (1.8)	.392
Funk	4.5 (1.5)	3.9 (1.7)	.017*
Reggae	4.4 (1.6)	3.8 (1.9)	.026*

<sup>a</sup>Total score of musical background

\**p* < .05 \*\**p* < .01