Personality and Individual Differences 241 (2025) 113162

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Music style preferences and well-being: A genetic perspective☆

Anastasiia Bratchenko [a], Penghao Xia [a,b], Dorret I. Boomsma [c], Miriam A. Mosing [a,b,d,e], Fredrik Ullén [a,b], Laura W. Wesseldijk [a,b,f,*]

[a] Department of Neuroscience, Karolinska Institutet, Sweden
[b] Department of Cognitive Neuropsychology, Max Planck Institute for Empirical Aesthetics, Frankfurt, Germany
[c] Department of Complex Trait Genetics, Vrije Universiteit Amsterdam, Amsterdam, the Netherlands
[d] Melbourne School of Psychological Sciences, Faculty of Medicine, Dentistry, and Health Sciences, University of Melbourne, Australia
[e] Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, Sweden
[f] Department of Psychiatry, Amsterdam UMC, University of Amsterdam, the Netherlands

ARTICLE INFO

Keywords:
Music styles
Music genre
Well-being
Twins
Polygenic indices

ABSTRACT

The relationship between music and well-being is multi-faceted and supported by a growing body of scientific research. Music has been associated with emotional, mental, physical, and social dimensions of well-being. However, whether different music style preferences are associated with well-being remains unclear, including the role of genetics and potential causality in these associations. This study examined the relationships between well-being and music style preferences in a genetically informative sample. We analysed data from 8879 adult monozygotic and dizygotic twins (1639 complete pairs) from the Swedish Twin Registry with a subset of 3764 participants with genotype data. Well-being was assessed by the WHO-10 questionnaire. Twins evaluated their preferences for 19 music styles. We found that preferences for pop, gospel and Swedish dance band were significantly associated with higher well-being and a preference for indie music with lower well-being. Analyses in monozygotic twin pairs that were discordant in their music preferences indicated that familial confounding by genetic and/or family environmental influences accounted for the observed relations. Polygenic indices for well-being did not predict preferences for these music styles. In summary, we found no evidence of causal associations between music style preferences and well-being.

1. Introduction

Music has been a part of people's lives since ancient times (Savage et al., 2015). Music helps us to form social connections (Savage et al., 2021) and affects a wide range of aspects of our lives, including our well-being (Dingle et al., 2021; Viola et al., 2023). People can engage in music in different ways, both actively by creating music and singing or playing a musical instrument or passively, e.g. when attending concerts or listening to music at home (Honing, 2018).

Well-being is a fundamental element of our health and in a general sense, refers to feeling good and functioning well (Diener, 1984; Ryff, 1989). Many studies indicate that music can have broad positive effects on overall well-being, affecting its emotional, mental, physical, and as well as social aspects (Cook et al., 2019; Dingle et al., 2021). Engaging with music helps regulate emotions and cope with stressful situations (Chong et al., 2024; Cook et al., 2019). For example, listening to energetic and rhythmic music is associated with better mood (Cook et al., 2019). Observational studies have shown that well-being is positively associated with listening to music (Krause et al., 2023; Vidas et al., 2022), playing a musical instrument (Dingle et al., 2021) and singing (Hendry et al., 2022). Intervention studies have also shown a positive association between music engagement and well-being, with most of the studies focusing on the effects of listening to music (Caló et al., 2020; Rodwin et al., 2023). However, it should be noted that a different picture has emerged from observational population-based studies in which people who are involved in music activities were found to be more vulnerable to mental problems than those who are not (Gustavson et al., 2021; Wesseldijk et al., 2019).

One of the reasons for these mixed findings could be that different music styles have different associations with well-being. There is evidence that listening to classical music and pop is positively associated with well-being (Bogt et al., 2021; Osmanoğlu & Yilmaz, 2019), while

☆ This article is part of a special issue entitled: Differences in Wellbeing published in Personality and Individual Differences.

* Corresponding author at: Department of Cognitive Neuropsychology, Max Planck Institute for Empirical Aesthetics, Frankfurt, Germany.
E-mail address: laura.wesseldijk@ki.se (L.W. Wesseldijk).

https://doi.org/10.1016/j.paid.2025.113162
Received 21 December 2024; Received in revised form 10 March 2025; Accepted 12 March 2025
Available online 9 April 2025

listening to rock music is linked to worse well-being (Bogt et al., 2021). A meta-analysis study showed that people who like heavy metal music more often benefit from listening to it than those who do not (Olsen et al., 2023). However, the literature on this is not consistent. For example, one study indicated that listening to metal music is associated with poor well-being (McFerran, 2016), while another study showed that listening to metal music is positively related to well-being (Olsen et al., 2023). There is a lack of evidence as to whether preferring many different music styles, i.e., being a musical omnivore, is beneficial for well-being.

Additionally, most of the discussed studies did not account for potential familial confounding. It is well-known that well-being is moderately heritable (Bartels, 2015). Music-related behavior is also partly influenced by genetic factors (Wesseldijk, Ullén, & Mosing, 2023), though less is known about why people like different music styles. However, it has been shown that choice of musical instrument, the genre of music individuals engage in and being musically omnivorous are influenced by genetic factors (Jæger & Møllegaard, 2022; Mosing & Ullén, 2018). Importantly, overlapping genetic factors between well-being and music preferences can create phenotypic associations in the absence of a causal relationship between the observed phenotypes (Watanabe et al., 2019). This has previously been shown for music engagement and mental health (Wesseldijk, Yi, Karlsson, Ullén, & Mosing, 2023). Similarly, family environmental factors can influence both mental health and a tendency to listen to a particular genre of music. For example, being raised in a household with more income may influence mental health outcomes and provide access to a wider variety of music, ultimately affecting one's music preferences. The co-twin control design, which compares monozygotic twins discordant for music preferences, helps disentangle causality from familial confounding, as such twins share both their genes and family environment (Gonggrijp et al., 2023). By controlling for familial confounding, this method allows us to investigate the potential causality of associations. If a preference for a specific music style truly causally affects well-being, we would expect to see that the twin who likes the music style also shows higher well-being on average.

Polygenic index (PGI) analyses also provide a tool for exploring the influence of genetics. A PGI is a personalised index that reflects an individual's genetic predisposition for a particular trait, calculated by combining information about their genotype with effect sizes derived from genome-wide association studies (GWAS) (Wray et al., 2021). A PGI for well-being, for example, can be applied to test whether genetic factors associated with well-being also contribute to preferences for specific music styles. However, it is important to note that a PGI reflects only a fraction of the total genetic influences relevant to well-being (Dudbridge, 2013; Fusar-Poli et al., 2022).

This study aims to examine the association between music style preferences and well-being in a genetically informative sample. First, we will explore the phenotypic associations between music style preferences and well-being in the total sample. Next, we will apply a co-twin control design in discordant monozygotic twin pairs to explore whether the detected associations are in line with causality. Lastly, we will investigate whether preferences in music styles are associated with a genetic propensity for well-being through a polygenic index analysis.

2. Methods

2.1. Preregistration

This study was preregistered at: https://aspredicted.org/KDF_WG6. We do not report results from bivariate twin models because associations between well-being and music style preferences were minimal, with the cross-twin-cross-trait correlations being close to zero. Since bivariate twin models are based on these correlations there was no basis to perform these analyses. All other analyses were performed as described in the preregistration.

2.2. Participants

The participants were monozygotic (MZ) and dizygotic (DZ) twins of the Swedish Twin Registry (Zagai et al., 2019). Zygosity assessment was based on either the twins of the pair being of the opposite sex, DNA markers, or an intra-pair similarity algorithm (Magnusson et al., 2013). The twins were part of "The Study of Twin Adults: Genes and Environment" (STAGE) cohort and were invited to join the second "Humans Making Music Study" (HUMMUS 2) in 2022. The study was approved by the Regional Ethical Review Board in Stockholm study (Dnrs 2011/570-31/5, 2012/1107/32, 2021-02014, 2022-00109-02, 2020-02575).

The HUMMUS 2 data collection included 9538 twins. Data on well-being and music style preferences were available for 8822 twins. Of those, 43 participants were excluded due to missing zygosity. The final dataset consisted of 8779 twins (755 complete MZ twin pairs and 884 complete DZ twin pairs) and a subset of 3764 participants with available genotype data. The participants' age varied from 37 to 63 years (mean = 51, SD = 7.77, 57 % females).

2.3. Measures

2.3.1. Well-being

Well-being was assessed with the WHO-10 questionnaire (Löve et al., 2014). The questionnaire has 10 items, that assess several domains of well-being, which are scored each item from 0 (never) to 3 (always). Examples of statements are "I have been waking up feeling fresh and rested", "I have felt calm and peaceful", and "I have felt well-adjusted to my life situation" (Löve et al., 2014). The first item is coded reversely. After we reversed the coding of the first item, the sum of all responses reflects each participant's well-being index, which ranges from 0 to 30, with a lower score indicating worse well-being. The Cronbach's Alpha value for these 10 items was 0.91, demonstrating good internal consistency.

2.3.2. Music style preference

The participants scored their preference from 1 ("dislike very much") to 7 ("like a lot") for 19 music styles: classical music, opera, jazz, blues, reggae, funk, pop, gospel, rock, soul, metal, electronic dance music, hip-hop/rap, indie/alternative rock, Swedish dance band, latin, country, Swedish folk music and world folk music. In addition, to calculate a score indicating individuals' tendency to prefer many different music styles, i.e., being a musical omnivore, we summed the number of times twins rated their preferences as 5 or above across the 19 music styles. We refer to a person who enjoys engaging with multiple music styles as a "musical omnivore" (Peterson & Simkus, 1992).

2.4. Covariates

We included sex, age, and level of education as covariates. Sex is coded as 0 = male and 1 = female. The level of education varied from 0 (pre-secondary education <9 years) to 6 (doctoral education). We included education as a covariate because it was previously causally associated with well-being (Armitage et al., 2024). We performed 20 single Generalized Estimating Equations regression (GEE) analyses to test the associations between sex, age and education with music style preferences and being a musical omnivore.

2.5. Phenotypic association analyses

We applied single GEE analyses to explore the relationship between well-being and music style preferences or being a musical omnivore (Hardin & Hilbe, 2012), accounting for familial relatedness by clustering family IDs and specifying a correlation structure parameter corstr = 'exchangeable'. For each music style preference and being a musical omnivore, we performed a single GEE model (20 in total). Additionally, we performed a multiple GEE model, with all 19 music style preferences (excluding the variable 'musical omnivore') in one model. This allowed us to account for individuals' overall tendencies to like or dislike multiple music styles and control for interdependencies among style preferences. By including the liking of all music styles together, we correct for the liking or disliking of multiple styles and therefore a tendency to possibly like a lot of styles (omnivore). Therefore, we address being a musical omnivore in two ways: as an independent variable in a single GEE model and in the multiple GEE model. A Matrix Spectral Decomposition in R was applied to obtain the number of independent dimensions in the data, which served to calculate the *p*-value corrected for multiple testing (Nyholt, 2004). Based on the Matrix Spectral Decomposition results, which showed 16 independent dimensions, the p-value threshold of 0.003 (0.05/16) was applied for significance. Only associations between well-being and music style preference below the p-value threshold of 0.003 were considered for further genetic analyses.

2.6. Genetic analyses

2.6.1. Co-twin control analysis

To explore whether familial factors explain associations between music preferences and well-being, or whether associations could be causal, we conducted a co-twin control analysis in MZ twin pairs who were discordant in their preferences for a specific music style (Gonggrijp et al., 2023). In these analyses, we control for familial factors as monozygotic twins share their genes and familial environment. We defined discordance in two different ways. First, we defined discordance based on a threshold of 4 (nor like nor dislike), comparing within pairs where one twin had a preference below or equal to this value (disliking or neutral preference) and the other above (liking), regardless of how strong the difference. Additionally, performed fixed effects regression analyses in MZ twins without defining a threshold for discordance (i.e. if twins did not score exactly the same, they were regarded as discordant) to match the phenotypic analyses (treating the styles liking items as continuous variables) using the plm package in R (Croissant & Millo, 2008).

2.6.2. Polygenic index analysis

For details about the genetic data processing of the genotyped twins see Wesseldijk et al. (2022). To explore the genetic link between music style preferences and well-being, we utilized PGIs based on a recent multivariate GWAS on well-being (Baselmans et al., 2019; Wray et al., 2021). We calculated PGIs for 8303 genotyped individuals of which 3764 (1141 MZ twins and 2623 DZ twins) participated in HUMMUS 2, creating weighted sums of trait-associated alleles at each single-nucleotide polymorphism (SNP) based on effect sizes from the well-being GWAS. Scores were imputed for MZ co-twins ($N = 709$). We first applied a linear unbiased prediction approach to correct for linkage disequilibrium (Ni et al., 2021; Robinson et al., 2017) and used PLINK 2 to calculate the PGIs afterwards. We matched the PGIs and the top 10 Principal Components (PCs) derived from the full genotyped sample to correct for ancestry structures, to our phenotypic data. We first validated the predictability of PGI for well-being and saw that the PGI for well-being predicted well-being in our sample ($\beta = 0.170$ (95 % CI: 0.139–0.201), $p < .001$). Including the imputed PGIs for MZ twins did not change this result ($\beta = 0.173$ (95 % CI: 0.145–0.202), $p < .001$). Next, we ran separate GEE models to assess whether an individual's genetic predisposition to well-being predicts the music style preferences that were phenotypically associated with well-being, controlling for sex, age, education level, and the 10 PCs.

3. Results

3.1. Descriptive statistics

Table 1 shows the descriptive statistics for levels of education, age, well-being, and music style preferences grouped by sex. There were more females than males in this sample (57 % females), on average individuals completed two or three years of post-secondary education and the average age was 51 (SD = 7.7). Women scored higher on preference for classic, opera, pop, gospel, soul, Swedish dance band, latin, Swedish folk and worldwide folk music styles (all $p < .001$). Additionally, women were more omnivorous than men ($p < .001$). As shown in Table 2, individuals with higher education reported stronger preferences for classical, opera, jazz, blues, funk, pop, gospel, soul, hip-hop/rap, indie, Latin, Swedish folk, folk/world music, and were more likely to be a musical omnivore ($\beta = 0.04$–0.28, all $p < .003$). In contrast, preferences for country, Swedish dance band, rock, and metal were associated with lower levels of education ($\beta = -0.05$ to -0.20, all $p < .003$), while reggae ($\beta = 0.025$ $p = .05$) and electrodance ($\beta = -0.014$ $p = .21$) showed no significant relationship with education level. Older age was linked to stronger preferences for classical, opera, jazz, blues, reggae, funk, pop, gospel, rock, soul, Swedish dance band, Latin, Swedish folk, folk/world, and musical omnivorousness ($\beta = 0.04$–0.26, all $p < .01$). In contrast, metal, electrodance, hip-hop/rap, and indie were favored more

Table 1
Descriptive statistics of levels of education, age, music style preferences, and well-being.

Variable name	Males			Females			*p-value*
	N	Mean	SD	N	Mean	SD	
Education	3788	3.46	1.42	4991	3.80	1.30	*< 0.001*
0. Pre-secondary < 9 years	37 (0.42 %)			22 (0.25 %)			*0.004*
1. Primary (9–10 years)	150 (1.7 %)			147 (1.7 %)			*0.011*
2. Upper-secondary (2–4 years)	1268 (14.4 %)			1056 (12 %)			*< 0.001*
3. Post-secondary (1 year)	271 (3.1 %)			385 (4.4 %)			*0.321*
4. Post-secondary (2–3 years)	832 (9.5 %)			1476 (16.8 %)			*< 0.001*
5. Post-secondary (4 years or more)	1114 (12.7 %)			1773 (20.2 %)			*< 0.001*
6. Doctoral	116 (1.3 %)			132 (1.5 %)			*0.247*
Age	3788	51.00	7.69	4991	50.80	7.78	*0.198*
Classic	3778	5.05	1.52	4977	5.17	1.52	*< 0.001*
Opera	3762	3.56	1.70	4935	3.83	1.72	*< 0.001*
Jazz	3780	4.05	1.79	4952	3.91	1.82	*< 0.001*
Blues	3767	4.70	1.63	4918	4.31	1.68	*< 0.001*
Reggae	3775	4.78	1.45	4948	4.69	1.47	*0.002*
Funk	3653	4.27	1.56	4704	4.16	1.57	*0.001*
Pop	3786	6.16	1.06	4986	6.54	0.82	*< 0.001*
Gospel	3757	4.22	1.56	4951	5.01	1.51	*< 0.001*
Rock	3784	6.37	1.00	4983	5.91	1.25	*< 0.001*
Soul	3737	5.06	1.45	4880	5.36	1.43	*< 0.001*
Metal	3775	4.62	1.90	4954	3.25	1.84	*< 0.001*
Electro dance	3770	4.44	1.82	4944	3.95	1.89	*< 0.001*
Hip-hop/rap	3770	3.72	1.83	4970	3.69	1.74	*0.550*
Indie	3637	4.63	1.58	4664	4.35	1.62	*< 0.001*
Swedish Dance band	3781	3.96	1.72	4986	4.23	1.78	*< 0.001*
Latin	3641	3.99	1.39	4717	4.47	1.43	*< 0.001*
Country	3780	4.96	1.41	4971	5.01	1.42	*0.102*
Swedish folk	3765	4.61	1.39	4937	4.96	1.38	*< 0.001*
Folk/world	3550	4.37	1.34	4522	4.68	1.32	*< 0.001*
Well-being	3788	18.30	5.33	4991	17.7	5.74	*< 0.001*
Omnivores	3788	10.30	3.95	4991	10.7	3.83	*< 0.001*

Note. The *p-value* for the Welch Two Sample *t*-test between males and females. Percentage calculated from a total sample size for the levels of education.

Table 2
Phenotypic associations between sex, age, level of education and the different music style preferences.

Music style	*β Sex (female)*	*β Age*	*β Education*
Classical	0.024 (−0.018–0.066)	0.139*** (0.118–0.161)	0.280*** (0.256–0.302)
Opera	0.104*** (0.061–0.147)	0.143*** (0.121–0.165)	0.221*** (0.199–0.243)
Jazz	−0.138*** (−0.181 - -0.095)	0.059*** (0.037–0.080)	0.234*** (0.217–0.260)
Blues	−0.265*** (−0.310 - -0.222)	0.186*** (0.164–0.207)	0.158*** (0.137–0.180)
Reggae	−0.060** (−0.104 - -0.015)	0.040** (0.017–0.062)	0.025* (0.003–0.048)
Funk	−0.104*** (−0.148 - -0.059)	0.036*** (0.014–0.059)	0.147*** (0.124–0.170)
Pop	0.386*** (0.341–0.430)	0.060*** (0.037–0.083)	0.041*** (0.018–0.064)
Gospel	0.481*** (0.439–0.524)	0.163*** (0.142–0.185)	0.104*** (0.082–0.125)
Rock	−0.384*** (−0.426 - -0.342)	0.054*** (0.032–0.077)	−0.047*** (−0.069 - -0.025)
Soul	0.167*** (0.123–0.211)	0.168*** (0.146–0.189)	0.158*** (0.136–0.180)
Metal	−0.668*** (−0.701 - -0.626)	−0.144*** (−0.165 - -0.123)	−0.079*** (−0.100 - -0.058)
Electrodance	−0.262*** (−0.304 - -0.220)	−0.212*** (−0.234 - -0.190)	−0.014 (−0.036–0.008)
Hip-hop/rap	−0.028 (−0.071–0.014)	−0.256*** (−0.277 - -0.234)	0.038*** (0.016–0.060)
Indie	−0.202*** (−0.247 - -0.158)	−0.127*** (−0.149 - -0.104)	0.123*** (0.100–0.145)
Swedish Dance band	0.205*** (0.163–0.248)	0.099*** (0.076–0.121)	−0.198*** (−0.212 - -0.177)
Latin	0.330*** (0.287–0.374)	0.089*** (0.066–0.112)	0.038*** (0.015–0.061)
Country	0.062** (0.018–0.106)	0.001 (−0.021–0.023)	−0.088*** (−0.110 - -0.066)
Swedish folk	0.239*** (0.195–0.282)	0.137*** (0.115–0.160)	0.078*** (0.055–0.101)
Folk/world	0.205*** (0.160–0.249)	0.116*** (0.093–0.139)	0.106*** (0.082–0.129)
Omnivores	0.068*** (0.024–0.112)	0.047*** (0.025–0.069)	0.111*** (0.089–0.133)

Note. β = standardised effects (with 95 % Confidence intervals). * = *p-value* < .05; ** = *p-value* < .01; *** = significant *p-value* < .003. Sex is coded as 0 = male, 1 = female.

by younger individuals (β = −0.14 to −0.26, all $p < .003$), and country showed no significant association with age.

3.2. Phenotypic association analyses

Preferences for four music styles - pop, gospel, Swedish dance band and indie - were significantly associated with well-being, applying a *p*-value threshold of 0.003 (Table 3, Fig. 1). Specifically, well-being was positively correlated with preferences for pop music (β = 0.064 (95 % CI: 0.042–0.086); $p < .003$), gospel music (β = 0.049 (95 % CI: 0.026–0.072); $p < .003$), and Swedish dance band music (β = 0.078 (95 % CI: 0.056–0.101); $p < .003$). Conversely, a preference for indie music was associated with lower levels of well-being (β = −0.038 (95 % CI: −0.061 to −0.015); $p < .003$).

Sex, age, and education level had significant effects on well-being, with higher age, higher education and male sex being associated with higher self-reported levels of well-being (see Table 3).

When analyzing all music style preferences together in a multivariate model, results were similar except that the association between gospel music and well-being became non-significant (see Table 4).

Table 3
Phenotypic associations between music style preferences and well-being estimated in single models, including sex, age and education as covariates.

Music style	*β (95 % CI)*	*β* Sex (female)	*β* Age	*β* Education
Classical	−0.012 (−0.035–0.010)	−0.12***	0.16***	0.06***
Opera	0.023* (0.001–0.046)	−0.12***	0.15***	0.06***
Jazz	0.030** (0.008–0.052)	−0.11***	0.15***	0.05***
Blues	0.010 (−0.012–0.032)	−0.11***	0.15***	0.06***
Reggae	0.009 (−0.013–0.031)	−0.12***	0.16***	0.06***
Funk	0.019 (−0.003–0.042)	−0.11***	0.16***	0.06***
Pop	**0.064*** (0.042–0.086)**	−0.14***	0.15***	0.06***
Gospel	**0.049*** (0.026–0.072)**	−0.14***	0.15***	0.05***
Rock	0.011 (−0.010–0.033)	−0.12***	0.16***	0.06***
Soul	0.030** (0.008–0.053)	−0.13***	0.15***	0.05***
Metal	−0.009 (−0.032–0.015)	−0.12***	0.16***	0.06***
Electrodance	0.020 (−0.002–0.042)	−0.11***	0.16***	0.06***
Hip-hop/rap	0.022* (0.00002–0.045)	−0.12***	0.16***	0.06***
Indie	**−0.038*** (−0.061 - -0.015)**	−0.12***	0.15***	0.07***
Swedish Dance band	**0.078*** (0.056–0.101)**	−0.13***	0.15***	0.08***
Latin	0.015 (−0.008–0.037)	−0.12***	0.15***	0.06***
Country	0.028* (0.006–0.050)	−0.12***	0.16***	0.06***
Swedish folk	0.009 (−0.013–0.031)	−0.12***	0.15***	0.06***
Folk/world	−0.007 (−0.030–0.015)	−0.11***	0.16***	0.06***
Omnivores	0.020 (−0.001–0.041)	−0.12***	0.16***	0.06***

Note. β = the standardised effects of music style preferences; 95 % CI = Confidence intervals; Age = the effect of age; Sex = the effect of sex (coded as 0 = male, 1 = female); Education = the effect of education; * = *p-value* < .05; ** = *p-value* < .01; *** = significant *p-value* < .003. The significant relationships between music preferences and well-being are highlighted in bold.

3.3. Genetic analyses

3.3.1. Co-twin-control design

When accounting for familial confounding in MZ co-twin-control analyses, there were no significant associations between well-being and the music style preferences of pop, gospel, indie, and Swedish dance band (see Fig. 1).

The co-twin control analyses defining discordance with a threshold showed that none of the associations between music style preferences and well-being remained significant (pop β = 0.084 (95 % CI: −0.068–0.024), p = .28, N_{pairs} = 79, gospel β = 0.035 (95 % CI: −0.049–0.119), p = .41, N_{pairs} = 306, indie β = 0.023 (95 % CI: −0.058–0.104), p = .57, N_{pairs} = 315, and Swedish dance band β = 0.031 (95 % CI: −0.059–0.121), p = .5, N_{pairs} = 251). Additionally, results were similar from co-twin-control analyses defining discordance based on the continuous scale (pop β = 0.007 (95 % CI: −0.070–0.085), p = .85 N_{pairs} = 429, gospel β = 0.049 (95 % CI: −0.022–0.121), p = .18, N_{pairs} = 662, indie β = −0.026 (95 % CI: −0.098–0.046), p = .48, N_{pairs} = 645, and Swedish dance band β = 0.067 (95 % CI: −0.011–0.144), p = .09, N_{pairs} = 690).

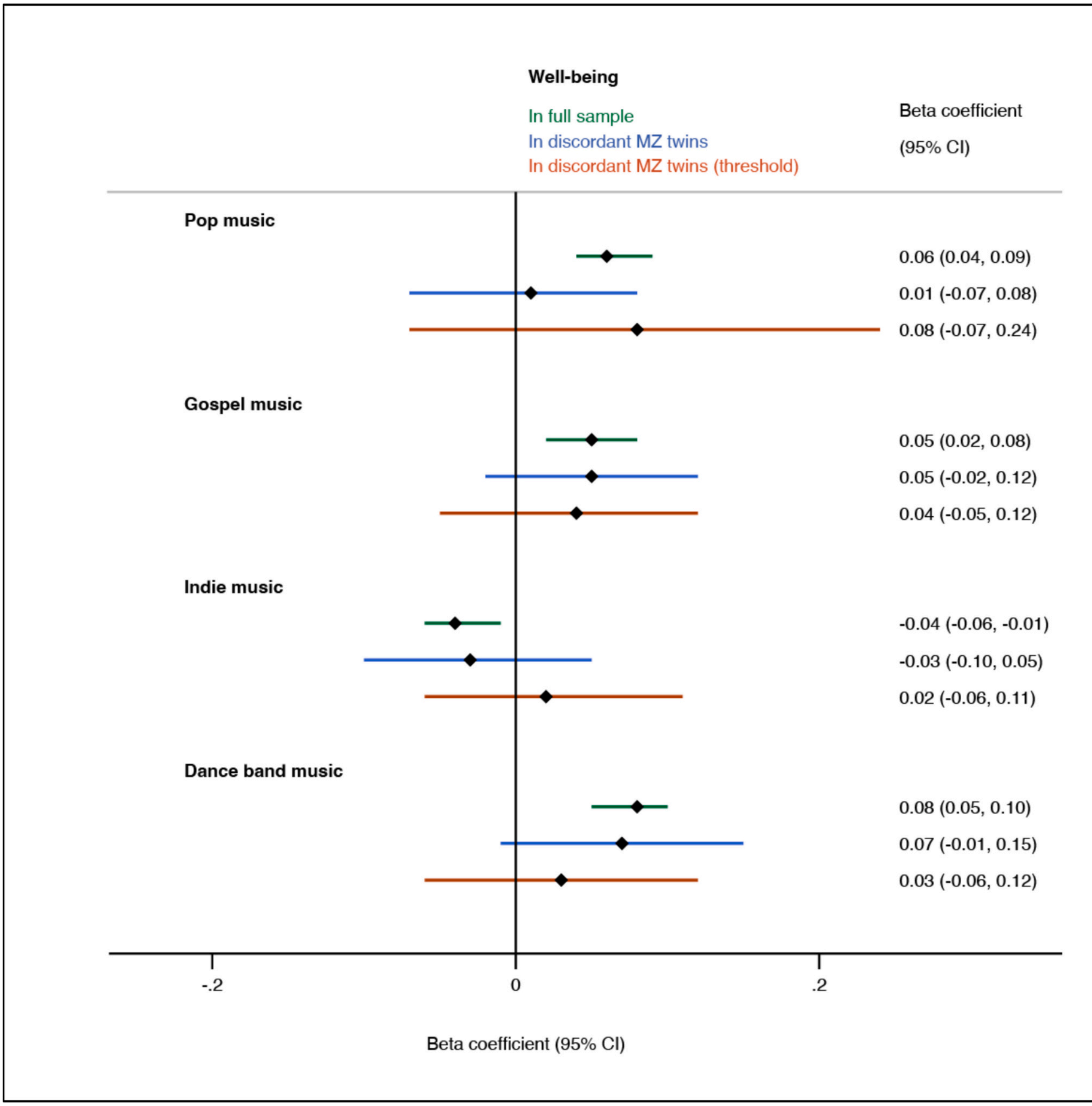

Fig. 1. Significant phenotypic associations between music style preferences and well-being in the full sample (green). The associations in blue and red were estimated within monozygotic twin pairs who differed in their music preferences to control for familial confounding. In blue, discordance is defined based on the full seven-point preference scale. In red, discordance is defined using a threshold of 4 ("neither like nor dislike"): one twin rated their preference at or below 4 (disliking or neutral), while the other rated above 4 (liking).

3.3.2. *Polygenic index analysis*

A genetic propensity for well-being did not predict a preference for pop style ($\beta = 0.018$ (95 % CI: -0.013–0.049), *p-value* = .25), gospel style ($\beta = -0.015$ (95 % CI: -0.045–0.016), $p = .35$), Swedish dance band style ($\beta = 0.001$ (95 % CI: -0.031–0.032), $p = .97$) nor indie style ($\beta = -0.025$ (95 % CI: -0.058–0.008), $p = .14$). Including imputed MZ twins showed nearly identical results with somewhat smaller 95 % CIs for pop style ($\beta = 0.018$ (95 % CI: -0.010–0.046), *p-value* = .21), gospel style ($\beta = -0.016$ (95 % CI: -0.044–0.013), $p = .29$), Swedish dance band style ($\beta = -0.002$ (95 % CI: -0.031–0.027), $p = .90$) and indie style ($\beta = -0.024$ (95 % CI: -0.055–0.007), $p = .13$).

4. Discussion

This study investigated associations between music style preferences and well-being taking familial factors into account. Most music style preferences were not associated with variations in well-being. Only preferences for pop, gospel, and Swedish dance band were associated with higher well-being and a preference for indie music style with lower self-reported well-being. However, these relationships were non-significant in discordant monozygotic twins, indicating familial confounding (overlapping genetic and/or family environmental influences) rather than causal influences between style preferences and well-being. Regardless, the polygenic indexes for well-being did not predict music style preferences suggesting that the overlapping genetic influences

Table 4
Phenotypic associations between music style preferences and well-being estimated in a multivariate model, including sex, age and education.

	β (95 % *CI*)	*p-value*
Sex (female)	−0.15 (−0.21–−0.1)	< 0.001
Age	0.15 (0.12–0.17)	< 0.001
Education	0.07 (0.05–0.1)	< 0.001
Classical	−0.04 (−0.08–−0.01)	0.012
Opera	0.03 (0.001–0.07)	0.042
Jazz	0.05 (0.01–0.08)	0.006
Blues	−0.01 (−0.05–0.02)	0.415
Reggae	−0.01 (−0.04–0.02)	0.533
Funk	0.0007 (−0.03–0.03)	0.964
Pop	**0.05 (0.02–0.08)**	**< 0.003**
Gospel	0.03 (0.01–0.06)	0.020
Rock	0.004 (−0.02–0.03)	0.800
Soul	0.02 (−0.02–0.05)	0.288
Metal	−0.002 (−0.03–0.03)	0.916
Electrodance	0.02 (−0.01–0.05)	0.193
Hip-hop/rap	0.03 (−0.01–0.06)	0.107
Indie	**−0.06 (−0.09–−0.03)**	**< 0.003**
Swedish Dance band	**0.08 (0.05–0.1)**	**< 0.003**
Latin	−0.02 (−0.05–0.01)	0.238
Country	−0.01 (−0.04–0.02)	0.638
Swedish folk	−0.02 (−0.06–0.01)	0.170
Folk/world	−0.004 (−0.04–0.03)	0.812

Note. β = standardised effects of music style preferences, 95 % CI = 95 % Confidence intervals, sex is coded as 0 = male, 1 = female. The significant associations ($p < .003$) between music preferences and well-being are highlighted in bold.

underlying well-being and music style preferences were small or that we lacked the power to detect them.

We found relatively small but significant associations between some music style preferences and well-being, in line with earlier reports of a negative association between well-being and indie style preference (Bogt et al., 2021) and positive associations between well-being and pop (Bogt et al., 2021) and gospel music styles (Bradshaw et al., 2015; Cook et al., 2019). The possible explanation of positive associations with well-being for pop, gospel and Swedish dance band music styles is that all these styles are rather happy and melodious songs. For instance, the study by Cook et al. (2019) indicated that upbeat and conventional music (i.e. pop, gospel) was associated with feeling more energized. On the contrary, some indie music tends to be more downbeat, introspective and subdued. For example, listening to intense and rebellious music (such as rock) is associated with better overcoming negative emotions (Cook et al., 2019).

In the model where all music styles were included, the association between gospel and well-being became non-significant. Possibly this indicates that people who prefer gospel music might also more often like other styles (e.g., pop, or dance band). The initial positive association with gospel might partially reflect their broader music preferences rather than an effect of gospel music specifically. To our knowledge, this study is the first large-scale analysis of relations between well-being and liking multiple music genres. However, we did not find evidence for an association between such musical omnivorousness and well-being.

The finding that significant relationships between music style preferences and well-being vanished after correcting for familial factors in monozygotic twins that prefer different music styles, indicates that familial factors play a role and that the observed associations are unlikely to be causal in nature. This is consistent with a previous study on mental health and playing music which also reported familial confounding in the association (Wesseldijk et al., 2019). Nevertheless, it is important to mention that regardless of the association becoming insignificant, the effect size for the association between well-being and pop style remained relatively similar. This could indicate a lack of power to detect an association when controlling for familial factors in a much smaller discordant twin sample.

Finally, analyses applying a polygenic index approach showed no evidence that genetic propensity for well-being predicts a preference for pop, gospel, indie and Swedish dance band music. Even though we did not find evidence for overlapping underlying genes influencing well-being and music style preferences using this approach, we should be cautious in interpreting these results since polygenic indexes capture only a fraction of genes contributing to the traits of interest and the phenotypic associations were small to begin with (Dudbridge, 2013; Fusar-Poli et al., 2022).

4.1. Strengths and limitations

To our knowledge, this is the first study on the association between music style preferences and well-being in a genetically informative sample. Second, we utilized data from a cohort of the Swedish Twin Registry which has rich and detailed information on music-related phenotypes from >8000 participants. In this resource, we found small but significant associations across 19 music style preferences, unlike previous studies that usually focused on a smaller selection of music styles.

Nevertheless, our self-reported measure of preference for 19 different music styles does not allow quantification of in which way (and intensity) participants engage with those music styles (listening, playing, or singing). Second, despite the large sample size, the number of discordant monozygotic twin pairs was relatively small, which can affect the power in the co-twin-control analyses. Lastly, we acknowledge that our findings may not generalize to other cultures. The majority of participants were around 50 years old, and many preferred Swedish dance band music, a genre unique to Swedish culture.

Future studies could investigate the genetic and environmental influences on music style preferences, examining whether overlapping or distinct genetic factors contribute to different style preferences, to shed light on why people prefer certain music styles.

4.2. Conclusion

Our findings suggest that most music style preferences are not associated with variations in well-being. While preferences for pop, gospel, and Swedish dance band music were linked to slightly higher well-being, and a preference for indie music to slightly lower well-being, these associations were likely explained by familial factors shared between well-being and music preferences. Therefore, it is unlikely that music style preferences causally influence well-being or vice versa.

CRediT authorship contribution statement

Anastasiia Bratchenko: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Penghao Xia:** Writing – review & editing, Data curation. **Dorret I. Boomsma:** Writing – review & editing, Supervision, Methodology. **Miriam A. Mosing:** Writing – review & editing, Methodology. **Fredrik Ullén:** Writing – review & editing, Methodology. **Laura W. Wesseldijk:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank the Swedish twins for their participation and the Swedish Twin Registry for the data. This study was funded by the Bank of Sweden Tercentenary Foundation (M11-0451:1), the Sven and Dagmar Salén Foundation, and the Marcus and Amalia Wallenberg Foundation (MAW 2018.0017). The Swedish Twin Registry is managed by Karolinska

Institutet and receives funding through the Swedish Research Council under the grant no 2017-00641. The computations were enabled by resources provided by the National Academic Infrastructure for Supercomputing in Sweden (NAISS) and the Swedish National Infrastructure for Computing (SNIC) at Uppsala Multidisciplinary Center for Advanced Computational Science (UPPMAX) partially funded by the Swedish Research Council through grant agreements no. 2022-06725 and no. 2018-05973.

Data availability

The datasets generated during the current study cannot be made publicly as registry data were used. Individuals are able to apply online at the Swedish Twin Registry to access the twin data. Our analyses code is available at https://osf.io/e6hzx/?view_only=f3017ec5f87a4403811d8395ae861d8e

During the preparation of this work the author(s) used ChatGPT in order to inquire about data analyses and cleaning code, seek guidance on figure optimization in Illustrator and assist in refining certain sentences for clarity. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

References

Armitage, J. M., Wootton, R. E., Davis, O. S. P., & Haworth, C. M. A. (2024). An exploration into the causal relationships between educational attainment, intelligence, and wellbeing: An observational and two-sample Mendelian randomisation study. *Npj Mental Health Research, 3*(1), 1–12. https://doi.org/10.1038/s44184-024-00066-x

Bartels, M. (2015). Genetics of wellbeing and its components satisfaction with life, happiness, and quality of life: A review and meta-analysis of heritability studies. *Behavior Genetics, 45*(2), 137–156. https://doi.org/10.1007/s10519-015-9713-y

Baselmans, B. M. L., Jansen, R., Ip, H. F., van Dongen, J., Abdellaoui, A., van de Weijer, M. P., … Bartels, M. (2019). Multivariate genome-wide analyses of the well-being spectrum. *Nature Genetics, 51*(3), Article 3. https://doi.org/10.1038/s41588-018-0320-8

Bogt, T. T., Hale, W. W., & Becht, A. (2021). "Wild years": Rock music, problem behaviors and mental well-being in adolescence and young adulthood. *Journal of Youth and Adolescence, 50*(12), 2487–2500. https://doi.org/10.1007/s10964-021-01505-0

Bradshaw, M., Ellison, C. G., Fang, Q., & Mueller, C. (2015). Listening to religious music and mental health in later life. *The Gerontologist, 55*(6), 961–971. https://doi.org/10.1093/geront/gnu020

Caló, F., Steiner, A., Millar, S., & Teasdale, S. (2020). The impact of a community-based music intervention on the health and well-being of young people: A realist evaluation. *Health & Social Care in the Community, 28*(3), 988–997. https://doi.org/10.1111/hsc.12931

Chong, H. J., Kim, H. J., & Kim, B. (2024). Scoping review on the use of music for emotion regulation. *Behavioral Sciences, 14*(9), Article 9. https://doi.org/10.3390/bs14090793

Cook, T., Roy, A. R. K., & Welker, K. M. (2019). Music as an emotion regulation strategy: An examination of genres of music and their roles in emotion regulation. *Psychology of Music, 47*(1), 144–154. https://doi.org/10.1177/0305735617734627

Croissant, Y., & Millo, G. (2008). Panel data econometrics in R: The plm package. *Journal of Statistical Software, 27*, 1–43. https://doi.org/10.18637/jss.v027.i02

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542–575. https://doi.org/10.1037/0033-2909.95.3.542

Dingle, G. A., Sharman, L. S., Bauer, Z., Beckman, E., Broughton, M., Bunzli, E., … Wright, O. R. L. (2021). How do music activities affect health and well-being? A scoping review of studies examining psychosocial mechanisms. *Frontiers in Psychology, 12*. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.713818.

Dudbridge, F. (2013). Power and predictive accuracy of polygenic risk scores. *PLoS Genetics, 9*(3), Article e1003348. https://doi.org/10.1371/journal.pgen.1003348

Fusar-Poli, L., Rutten, B. P. F., van Os, J., Aguglia, E., & Guloksuz, S. (2022). Polygenic risk scores for predicting outcomes and treatment response in psychiatry: Hope or hype? *International Review of Psychiatry, 34*(7–8), 663–675. https://doi.org/10.1080/09540261.2022.2101352

Gonggrijp, B. M. A., van de Weijer, S. G. A., Bijleveld, C. C. J. H., van Dongen, J., & Boomsma, D. I. (2023). The co-twin control design: Implementation and methodological considerations. *Twin Research and Human Genetics, 1–8*. https://doi.org/10.1017/thg.2023.35

Gustavson, D. E., Coleman, P. L., Iversen, J. R., Maes, H. H., Gordon, R. L., & Lense, M. D. (2021). Mental health and music engagement: Review, framework, and guidelines for future studies. *Translational Psychiatry, 11*(1), Article 370. https://doi.org/10.1038/s41398-021-01483-8

Hardin, J. W., & Hilbe, J. M. (2012). *Generalized estimating equations* (2nd ed.). CRC Press. https://doi.org/10.1201/b13880.

Hendry, N., Lynam, D. S., & Lafarge, C. (2022). Singing for wellbeing: Formulating a model for community group singing interventions. *Qualitative Health Research, 32*(8–9), 1399–1414. https://doi.org/10.1177/10497323221104718

Honing, H. (2018). On the biological basis of musicality. *Annals of the New York Academy of Sciences, 1423*(1), 51–56. https://doi.org/10.1111/nyas.13638

Jæger, M. M., & Møllegaard, S. (2022). Where do cultural tastes come from? Genes, environments, or experiences. *Sociological Science, 9*, 252–274. https://doi.org/10.15195/v9.a11

Krause, A. E., Scott, W. G., Flynn, S., Foong, B., Goh, K., Wake, S., … Garvey, D. (2023). Listening to music to cope with everyday stressors. *Musicae Scientiae, 27*(1), 176–192. https://doi.org/10.1177/10298649211030318

Löve, J., Andersson, L., Moore, C. D., & Hensing, G. (2014). Psychometric analysis of the Swedish translation of the WHO well-being index. *Quality of Life Research, 23*(1), 293–297. https://doi.org/10.1007/s11136-013-0447-0

Magnusson, P. K. E., Almqvist, C., Rahman, I., Ganna, A., Viktorin, A., Walum, H., … Lichtenstein, P. (2013). The Swedish twin registry: Establishment of a biobank and other recent developments. *Twin Research and Human Genetics, 16*(1), 317–329. https://doi.org/10.1017/thg.2012.104

McFerran, K. S. (2016). Contextualising the relationship between music, emotions and the well-being of young people: A critical interpretive synthesis. *Musicae Scientiae, 20*(1), 103–121. https://doi.org/10.1177/1029864915626968

Mosing, M. A., & Ullén, F. (2018). Genetic influences on musical specialization: A twin study on choice of instrument and music genre. *Annals of the New York Academy of Sciences, 1423*(1), 427–434. https://doi.org/10.1111/nyas.13626

Ni, G., Zeng, J., Revez, J. A., Wang, Y., Zheng, Z., Ge, T., … Wray, N. R. (2021). A comparison of ten polygenic score methods for psychiatric disorders applied across multiple cohorts. *Biological Psychiatry, 90*(9), 611–620. https://doi.org/10.1016/j.biopsych.2021.04.018

Nyholt, D. R. (2004). A simple correction for multiple testing for single-nucleotide polymorphisms in linkage disequilibrium with each other. *American Journal of Human Genetics, 74*(4), 765–769. https://doi.org/10.1086/383251

Olsen, K. N., Terry, J., & Thompson, W. F. (2023). Psychosocial risks and benefits of exposure to heavy metal music with aggressive themes: Current theory and evidence. *Current Psychology, 42*(24), 21133–21150. https://doi.org/10.1007/s12144-022-03108-9

Osmanoğlu, D. E., & Yilmaz, H. (2019). The Effect of Classical Music on Anxiety and Well-Being of University Students. *International Education Studies, 12*(11), 18. https://doi.org/10.5539/ies.v12n11p18

Peterson, R. A., & Simkus, A. (1992). How musical tastes mark occupational status groups. In M. Lamont, & M. Fournier (Eds.), *Cultivating differences: Symbolic boundaries and the making of inequality* (p. 152). Chicago: University of Chicago Press. https://doi.org/10.1086/230505.

Robinson, M. R., Kleinman, A., Graff, M., Vinkhuyzen, A. A. E., Couper, D., Miller, M. B., … Visscher, P. M. (2017). Genetic evidence of assortative mating in humans. *Nature Human Behaviour, 1*(1), 1–13. https://doi.org/10.1038/s41562-016-0016

Rodwin, A. H., Shimizu, R., Travis, R., James, K. J., Banya, M., & Munson, M. R. (2023). A systematic review of music-based interventions to improve treatment engagement and mental health outcomes for adolescents and young adults. *Child and Adolescent Social Work Journal, 40*(4), 537–566. https://doi.org/10.1007/s10560-022-00893-x

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069–1081. https://doi.org/10.1037/0022-3514.57.6.1069

Savage, P. E., Brown, S., Sakai, E., & Currie, T. E. (2015). Statistical universals reveal the structures and functions of human music. *Proceedings of the National Academy of Sciences, 112*(29), 8987–8992. https://doi.org/10.1073/pnas.1414495112

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

Vidas, D., Nelson, N. L., & Dingle, G. A. (2022). Music listening as a coping resource in domestic and international university students. *Psychology of Music, 50*(6), 1816–1836. https://doi.org/10.1177/03057356211066964

Viola, E., Martorana, M., Airoldi, C., Meini, C., Ceriotti, D., De Vito, M., De Ambrosi, D., & Faggiano, F. (2023). The role of music in promoting health and wellbeing: A systematic review and meta-analysis. *European Journal of Public Health, 33*(4), 738–745. https://doi.org/10.1093/eurpub/ckad063

Watanabe, K., Stringer, S., Frei, O., Umićević Mirkov, M., de Leeuw, C., Polderman, T. J. C., … Posthuma, D. (2019). A global overview of pleiotropy and genetic architecture in complex traits. *Nature Genetics, 51*(9), 1339–1348. https://doi.org/10.1038/s41588-019-0481-0

Wesseldijk, L. W., Abdellaoui, A., Gordon, R. L., Ullén, F., & Mosing, M. A. (2022). Using a polygenic score in a family design to understand genetic influences on musicality. *Scientific Reports, 12*(1), Article 1. https://doi.org/10.1038/s41598-022-18703-w

Wesseldijk, L. W., Ullén, F., & Mosing, M. A. (2019). The effects of playing music on mental health outcomes. *Scientific Reports, 9*(1), Article 1. https://doi.org/10.1038/s41598-019-49099-9

Wesseldijk, L. W., Ullén, F., & Mosing, M. A. (2023). Music and genetics. *Neuroscience & Biobehavioral Reviews, 152*, Article 105302. https://doi.org/10.1016/j.neubiorev.2023.105302

Wesseldijk, L. W., Yi, L., Karlsson, R., Ullén, F., & Mosing, M. A. (2023). A comprehensive investigation into the genetic relationship between music engagement and mental health. *Translational Psychiatry, 13*, 15. https://doi.org/10.1038/s41398-023-02308-6

Wray, N. R., Lin, T., Austin, J., McGrath, J. J., Hickie, I. B., Murray, G. K., & Visscher, P. M. (2021). From basic science to clinical application of polygenic risk scores: A primer. *JAMA Psychiatry, 78*(1), 101–109. https://doi.org/10.1001/jamapsychiatry.2020.3049

Zagai, U., Lichtenstein, P., Pedersen, N. L., & Magnusson, P. K. E. (2019). The Swedish twin registry: Content and management as a research infrastructure. *Twin Research and Human Genetics, 22*(6), 672–680. https://doi.org/10.1017/thg.2019.99