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Self-Awareness of Musical Ability

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We asked whether adults have accurate self-awareness of their musical ability, and whether such self-awareness relates to other individual differences. Participants ($N = 256$) rated how musical they were compared to their friends, colleagues, family, and the general population. They subsequently completed self-report measures of musical behaviors (Goldsmiths Musical Sophistication Index [Gold-MSI]) and personality, as well as objective tests of cognitive (matrix reasoning problems) and musical (Musical Ear Test [MET]) abilities. Participants considered themselves to be more musical than their colleagues and family but not than their friends and the general population. Correlations with Gold-MSI scores provided evidence for the construct and content validity of the self-ratings. Musicality self-ratings were associated with better performance on the Melody (but not the rhythm) subtest of the MET, higher levels of openness-to-experience and extraversion, and gender: men rated themselves as particularly musical even though there were no gender differences in objective musical ability. Cognitive ability was not associated with self-ratings although it predicted MET scores and the accuracy of self-ratings. In short, individuals exhibited self-awareness for pitch-based aspects of their musical ability. Their evaluations were associated with their personalities and tended to be exaggerated, however, particularly for men and for participants with lower cognitive ability.

Keywords: music, ability, metacognition, training, personality

Like most human traits, musical ability varies widely across individuals. Although it is tempting to think that musical expertise results from music training and practice (Ericsson et al., 1993; Howe et al., 1998; Schellenberg, 2020), there is a strong genetic component (Hambrick & Tucker-Drob, 2015; Mosing et al., 2014), which is consistent with the concept of musical *aptitude* (i.e., natural musical ability, talent, and a good ear). Indeed, when musical ability among typically developing children is measured with music-perception tests, performance is relatively *uninfluenced* by formal music training. Rather, natural ability appears to determine who takes music lessons (Kragness et al., 2021). Consequently, musical ability has become the focus of much research, particularly when it has the potential to explain associations between musical and nonmusical domains that were thought previously to stem from music training, such as general cognitive ability (Mosing et al., 2016; Swaminathan et al., 2017, 2018) and speech or language processing (Bhatara et al., 2015; Correia, Castro, et al., 2022; Foncubierta et al., 2020; Mankel & Bidelman, 2018; Mankel et al., 2020; Slevc & Miyake, 2006; Swaminathan & Schellenberg, 2017, 2020).

In the present investigation, we asked whether participants' intuitive self-perceptions of their musical ability relate to their ability measured objectively and with a self-report questionnaire, and whether such self-awareness is associated with other individual differences. These questions have practical and theoretical importance. On a practical level, music is a universal feature of human cultures and a central part of identity formation (Frith, 1996; van der Hoeven, 2018), particularly for young adults in Western societies. For example, when young adults are becoming acquainted, musical preferences are one of the most frequent topics of discussion, presumably because such preferences (and other musical behaviors) reveal much about one's personality (Rentfrow & Gosling, 2006). Thus, if music-related individual differences are central to social interactions, it behooves psychologists to understand them as well as possible.

On a theoretical level (Duval & Wicklund, 1972; Rochat, 2003), self-awareness of musical ability is one aspect of *metacognition* (Metcalfe & Shimamura, 1994), which refers to knowledge of one's cognitive abilities, as well as the ability to monitor and control cognitive activity. Whereas the latter is related to executive functioning, the former is more self-reflective, referring to individuals' knowledge of their cognitive strengths and weaknesses, both within themselves (e.g., good vocabulary but poor mathematical skills) and compared with others. Rochat (2003) describes self-awareness as "arguably the most fundamental issue in psychology" (p. 717), which develops rapidly from infancy to 5 years of age, yet in adulthood remains as the nexus of communication between different levels of consciousness. Self-awareness differs from self-consciousness, a form of meta-self-awareness, when the self is aware of how it is viewed by others (Rochat, 2003).

Self-awareness can be measured by way of the "rouge test" (mirror self-recognition) in infancy (e.g., Amsterdam, 1972), and by tests of theory of mind (Baron-Cohen et al., 1985), when by 4 years of age children realize that someone else holds a false belief, self-aware that

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they know the truth. Later in development, researchers may ask typically developing participants to estimate their ability to remember words (Murphy et al., 2022), or cognitively intact (Schoo et al., 2013) or impaired (Piras et al., 2016) individuals to rate their cognitive abilities. Typically developing individuals tend to overestimate their abilities across cognitive domains (e.g., attention and memory), whereas cognitively impaired individuals become more inaccurate as their impairments are more severe. Metacognitive skills also become more general over the adolescent years, showing greater similarity across domains (van der Stel & Veenman, 2014).

Previous studies of self-awareness of musical ability include an ethnographic analysis of eight children in fourth grade (Shouldice, 2020), and an article that reported four case studies of adults (Ruddock & Leong, 2005). Other studies focused on musicians' and music students' perceived *self-efficacy* (e.g., Hendricks, 2014; Nielsen, 2004), self-beliefs that are extended to actual behavior in context. In music, self-efficacy refers to people's beliefs in their ability to learn or perform music proficiently (e.g., Gill et al., 2022; McPherson & McCormick, 2006; Ritchie & Williamon, 2007, 2012). Self-efficacy relates to professional experience in adults (Papageorgi et al., 2009), and to music instruction in primary school students (Ritchie & Williamon, 2011). As Bandura's (1977, 1986) theory predicts (Hendricks, 2016; Zelenak, 2020), musicians' and music students' self-efficacy beliefs about their musical skills are also associated with their accomplishments in previous performances (Papageorgi et al., 2009; Zelenak, 2015), feedback and support from others (Gill et al., 2022; Hendricks, 2014; Zarza-Alzugaray et al., 2020), observations and comparisons with other people's performances (Zelenak, 2010), and physiological and emotional responses (e.g., arousal levels and anxiety) evoked by performing music (Zarza-Alzugaray et al., 2020; Zelenak, 2010). Importantly, the quality of musicians' performances is predicted better by their perceived self-efficacy than by duration of music training and/or frequency of practice (McCormick & McPherson, 2003; McPherson & McCormick, 2006; Ritchie & Williamon, 2012). In other words, for musicians and music students, perceived self-efficacy is associated with better performance skills.

The present study differed from earlier reports because we examined self-perceptions of musical ability among adults who were not, for the most part, musicians. One goal was to determine whether the link between self-perceptions and objectively measured ability extends to individuals with minimal or no music training, and therefore minimal performance experience and external feedback. For musically untrained individuals, self-awareness of musical ability is likely to stem primarily from social comparisons and self-evaluations. Thus, at the beginning of the study, our participants made social comparisons, rating how musical they were in relation to their family, friends, colleagues, and the general population. *Musical* was left undefined so that it would not influence or prime responses, and because we were interested in participants' intuitions about musicality.

Comparative self-ratings were collected first so that they would not be affected by the subsequent tests, which included self-report measures of musical behaviors (Goldsmiths Musical Sophistication Index [Gold-MSI], Müllensiefen et al., 2014) and personality, followed by objective tests of general cognitive and musical ability. The test of musical ability—the Musical Ear Test (MET, Wallentin et al., 2010)—required participants to determine whether standard and comparison tone sequences were identical. Such same-different tasks allow the MET and similar tests (Law & Zentner, 2012; Peretz et al., 2013; Ullén et al., 2014) to be administered to musically trained and untrained children and adults. Although these tests do *not* measure all aspects of musical ability, they measure fundamental aspects of music perception objectively, reliably, and validly.

In addition to asking whether self-rated musical ability is associated with objective musical ability, we asked whether self-ratings would be more closely related to performance on one of the MET's two subtests: melody or rhythm, which require participants to discriminate sequences that differ in pitch or time, respectively. In previous large-sample studies, music *training* was a better predictor of melody than of rhythm scores (Correia, Vincenzi, et al., 2022; Swaminathan et al., 2021), possibly because formal training in Western music emphasizes pitch patterns (i.e., melody and harmony) more than temporal patterns (i.e., meter and rhythm). More generally, conceptions of musicality in Western (European and North American) musical cultures tend to focus more on pitch compared to rhythm, at least before the relatively recent surge in popularity of rap and hip-hop music. Because our sample was recruited in Europe (Portugal), we hypothesized that self-ratings of musicality would also be more closely linked to scores on the melody compared to the rhythm subtest.

We included the Gold-MSI (Müllensiefen et al., 2014) primarily to examine the self-ratings' construct validity, and because its assessment of musicality is much broader than that of objective measures. The Gold-MSI is a reliable, valid, and widely used index of musical sophistication, which provides separate scores for five subscales that measure specific abilities and behaviors, including music training, emotional responding, perceptual abilities, singing abilities, and active engagement with music, as well as a general factor (aggregate index) of musical sophistication. Correlations with the general factor would provide evidence for the construct validity of participants' self-ratings, whereas correlations across subtests would provide evidence of their content validity, indicating that self-defined musical ability is commensurate with scholars' concepts of musical expertise. Moreover, differences across subscales in the magnitude of the associations with self-ratings would identify which behaviors are deemed by participants to be the best indicators of musicality. In short, another main objective of the present study was to determine whether participants' intuitive notions of their own musicality would predict the relatively detailed but multifaceted information provided by the Gold-MSI.

One trait from the Big Five model (John & Srivastava, 1999; McCrae & John, 1992)—openness-to-experience (hereafter *openness*)—has positive associations with musical ability, music training, and professional musicianship (Butkovic et al., 2015; Correia, Vincenzi, et al., 2022; Corrigall et al., 2013; Kuckelkorn et al., 2021; Swaminathan & Schellenberg, 2018; Vincenzi et al., 2022). It is also correlated positively with all scores provided by the Gold-MSI (Lima et al., 2020). These associations led us to predict that people with higher levels of openness would also consider themselves to be more musical. Extraversion is additionally predictive of being a professional musician (Kuckelkorn et al., 2021; Vincenzi et al., 2022), and of self-reports of musical experiences, including the Gold-MSI general factor and its Active Engagement, Singing Abilities, and Emotions subscales (Lima et al., 2020). Thus, comparative self-ratings of musicality could also be associated with extraversion.

Finally, we expected participants' self-evaluations to exhibit biases that have been observed in other domains, including a general trend for individuals to judge themselves as better than average, and a particular bias among men to over-rate their abilities. The better-than-average effect is highly reliable and refers to individuals' tendency to self-evaluate themselves as above average across many different abilities, attributes, and personality traits (Zell et al., 2020). For example, individuals in the U.S. rate themselves as higher in comparison with the average American on desirable traits such as intelligence, reliability, loyalty, and attractiveness (Ziano et al., 2021). We predicted this bias would also be evident for musical ability in a sample of Portuguese individuals.

The gender bias refers to findings showing that men provide higher self-ratings compared to women in nonmusical domains, such as academic ability (Cooper et al., 2018) and job performance (Herbst, 2020). In one study (Exley & Kessler, 2022), participants took a multiple-choice test on science and math and subsequently rated how well they did on the test. Even though there was no gender difference in performance, men provided higher self-ratings compared to women, and this male bias was observed even among sixth graders. Similar studies of musical ability are scarce with adults, although illusory male advantages have been identified among high school (Hendricks et al., 2015) and university (Nielsen, 2004) music students. In any event, we predicted that men would provide higher self-ratings compared to women.

Other findings from previous studies (Correia, Vincenzi, et al., 2022; Swaminathan et al., 2021; Wallentin et al., 2010) motivated additional predictions about general cognitive ability, which was expected to correlate positively with performance on the MET, and with metacognitive *accuracy*, in the same way that general ability has a positive but moderate association with metacognitive ability in other domains (Ohtani & Hisasaka, 2018). We did not, however, expect cognitive ability to be associated with absolute levels of musicality self-ratings, because typically developing and even high-functioning individuals (e.g., Che Guevara and Ulysses S. Grant) can be atypically unmusical (i.e., as in congenital amusia; Peretz & Vuvan, 2017), whereas low-functioning individuals, such as individuals with Williams Syndrome (IQ: $M \approx 70$; Mervis & Becerra, 2007), can be surprisingly musical (Don et al., 1999; Levitin et al., 2004).

In short, we examined self-ratings of musicality, asking whether they reflect objective musical ability, whether they are associated differentially with distinct aspects of musical expertise, and whether they—and their accuracy—are predicted by other individual differences.

Method

Participants

The study and research protocol were approved by the local ethics committee at Iscte, University Institute of Lisbon (reference 07/2021). All participants provided informed consent. They were 256 Portuguese-speaking adults (195 women and 61 men), who ranged in age from 18 to 66 years ($M = 25.0$, $SD = 9.0$, median/mode = 22.0), although most were young adults (i.e., 84% were under 30). Participants were recruited without regard to musical background to take part in an online study of musical ability and personality. Feedback about their ability and personality was offered as an incentive. Most participants were friends, acquaintances, and family members of first-year master's students enrolled in an organizational psychology program. As in many online tests, we sought to recruit as many participants as possible within the time frame of the study. Post hoc power analysis conducted with G*Power 3.1 (Faul et al., 2007) confirmed that a sample of 256 participants provided more than a 95% probability of detecting pairwise correlations of .1 or greater ($\alpha = .05$, two-tailed).

Most participants had completed high school ($n = 142$) or obtained an undergraduate degree ($n = 92$). Others had a master's degree ($n = 2$) or had not finished high school ($n = 2$). Women had, in general, more education than men, $p = .043$, such that education was held constant in statistical analyses involving gender. Almost half of the participants ($n = 117$) had no formal training in music, 63 had 2 years or less, and 35 had 2–5 years. According to the convention, only 41 of 256 (16%) would therefore be classified as *musicians* or *musically trained*, with six or more years of lessons (Zhang et al., 2020). Duration of music lessons had no association with gender, age, or education, $ps > .2$.

Materials and Tasks

Online stimulus presentation and data collection were programmed in Gorilla Experiment Builder (Anwyl-Irvine et al., 2020), an online platform for behavioral research. The tests included in this study have good reliability and validity (Correia, Vincenzi, et al., 2022) and are freely available on Gorilla (https://app.gorilla.sc/openmaterials/218554).

Musicality Self-Ratings

Participants responded to four questions regarding how musical they were compared with their family, friends, work/school colleagues, and the general population. Responses were made on scales that ranged from 1 (*far below average*) to 7 (*far above average*), with 4 indicating average musical ability.

Gold-MSI

The Gold-MSI (Müllensiefen et al., 2014; Portuguese version: Lima et al., 2020) is a 38-item self-report questionnaire that provides five subscales quantifying musical behaviors and experiences: Active Engagement (e.g., *I often read or search the internet for things related to music*, Cronbach's α in the present study = .833), Perceptual Abilities (e.g., *I can tell when people sing or play out of tune*, $\alpha = .803$), Music Training (e.g., *I have had _______ years of formal training on a musical instrument [including voice] during my lifetime*, $\alpha = .881$), Singing Abilities (e.g., *When I sing, I have no idea whether I'm in tune or not*—reverse coded, $\alpha = .771$), and Emotions (e.g., *Music can evoke my memories of past people and places*, $\alpha = .681$). An aggregate General Factor is calculated using items from each subscale ($\alpha = .886$).

Participants responded using a scale that ranged from 1 (*completely agree*) to 7 (*completely disagree*), except for the last seven items, when response alternatives remained on 7-point scales but referred to something other than agreement. For example, for the item that measured duration of regular music lessons (see example above), a score of 1 represented no lessons, 4 represented 2 years, and 7 represented 10 years or more. The Music Training subscale includes items other than years of lessons and regular practice (e.g., music theory, compliments on performances, and number of instruments played), but it does not ask for information about when participants started learning or playing music. A 39th open-ended item asks which instrument participants play best.

Big Five Inventory (BFI)

The BFI (John & Srivastava, 1999; Portuguese version: Brito-Costa et al., 2015) is a self-report questionnaire commonly used to measure personality traits as described by the five-factor model (John & Srivastava, 1999; McCrae & John, 1992). It has 44 items that participants rate on a scale from 1 (*disagree strongly*) to 5 (*agree strongly*). Each rating refers to how much it applies to the participant (e.g., *I am talkative*). The items are grouped and averaged to form the big-five personality traits: openness ($\alpha = .824$), conscientiousness ($\alpha = .816$), extraversion ($\alpha = .858$), agreeableness ($\alpha = .709$), and neuroticism ($\alpha = .871$).

Matrix Reasoning Item Bank (MaRs-IB)

The MaRs-IB (Chierchia et al., 2019) is an online task used to measure abstract nonverbal reasoning as a proxy for general cognitive ability (e.g., Nussenbaum et al., 2020; Vincenzi et al., 2022). It is modeled after Raven's Progressive Matrices test (Raven & Raven, 2003). On each of 80 trials, participants view a matrix with nine cells (3×3): eight of them are filled with abstract shapes that vary systematically on four dimensions (color, size, shape, and location), but the cell in the bottom-right position is always empty. Following the sequential logic of the filled cells, participants are asked which of four alternatives fits the missing cell. The task has a fixed duration of 8 min, regardless of the number of trials completed by each participant. Participants are unaware of task duration, but they are told that they must respond to each trial in 30 s or less, otherwise the task automatically proceeds to the next trial. If participants complete all 80 trials in less than 8 min, trials are represented in the same order but responses from repeated trials are not recorded (first 20 trials: $N = 256$, $\alpha = .963$; first 30: $N = 224$, $\alpha = .983$). The score for each participant is the proportion of trials answered correctly, excluding responses provided in less than 250 ms, which we logit-transformed for statistical analyses.

MET

The MET evaluates music-perception abilities (Wallentin et al., 2010), which the test's creators refer to as musical *competence*. It is designed in the tradition of older music-aptitude tests (e.g., E. Gordon, 1984), with separate subtests for melody ($\alpha = .767$) and rhythm ($\alpha = .713$). Both subtests have 52 trials. Trials and subtests are presented in a fixed order (melody then rhythm). Two additional practice trials are presented at the beginning of each subtest. Feedback is provided for practice trials but not for test trials.

On each trial, participants hear two short sequences of piano tones (melody) or drumbeats (rhythm), followed by a brief response window (for melody: 1,500 ms; for rhythm: 1,659–3,230 ms). The task is to judge whether the second sequence is identical to the first. On nonidentical trials (26 of 52), the second sequence includes at least one changed tone in the melody subtest, and at least one changed inter-onset interval in the rhythm subtest. The entire MET has a duration of approximately 20 min (see Swaminathan et al., 2021 for a detailed description of the MET stimuli). Scores for both subtests are calculated as the number of correct responses.

Scores for participants with more than 10 missing responses on a subtest, or who scored significantly below chance levels (melody, $n = 11$; rhythm, $n = 11$) were not considered in the statistical analyses.

Procedure

Participants completed a single online testing session in *Gorilla*, which lasted approximately 45 min. Before starting the experiment, they were asked to sit in a quiet place, to wear headphones, and to turn off sound notifications on their personal electronic devices. After providing informed consent, they completed the self-report measures in a fixed order (musicality self-ratings, Gold-MSI, and BFI), followed by the objective-ability tests (MaRs-IB and MET). After completing the testing session, participants received summary feedback about their personality, musical sophistication, and musical abilities. Ethical considerations precluded feedback about cognitive ability.

Results

Self-Ratings of Musical Ability

To test for better-than-average effects, one-sample *t* tests (two-tailed) compared musicality self-ratings to the midpoint (four) of the four 7-point scales. After correction for multiple (four) tests, the results confirmed that participants judged themselves to be more musical than their family ($M = 4.79$, $SD = 1.33$), Cohen's $d = .595$, and their colleagues ($M = 4.37$, $SD = 1.44$), $d = .256$, $ps < .001$, but not than their friends ($M = 4.22$, $SD = 1.41$), $d = .156$, $p = .054$, or the general population ($M = 3.98$, $SD = 1.40$), $d = -.014$, $p > .9$. A repeated-measures analysis of variance (ANOVA) confirmed that ratings varied across the four scales, $F(3, 765) = 44.55$, $p < .001$, partial $\eta^2 = .149$. Despite differences in absolute magnitude, the four self-musicality ratings were intercorrelated, $.541 \leq rs \leq .798$, $ps < .001$, which motivated formation of an aggregate (average) musicality self-rating score for use in the remaining analyses (Cronbach's $\alpha = .885$). The mean aggregate score was also higher than the scales' midpoint ($M = 4.34$, $SD = 1.20$), $d = .282$, $p < .001$. Aggregate ratings were not correlated with age or education, $ps \geq .586$.

Gender: Self-Ratings Versus Objective Ability and Gold-MSI Scores

As predicted, aggregate ratings of musicality were higher for men than for women (education held constant), $F(1, 253) = 10.64$, $p = .001$, partial $\eta^2 = .040$, which led us to ask whether gender predicted objective musical ability. A mixed-design ANOVA with MET subtest (melody and rhythm) as a repeated measure and gender as a between-subjects variable revealed no main effect of gender, $F(1, 236) = 1.54$, $p = .215$, partial $\eta^2 = .007$. There was a main effect of subtest, with higher scores for rhythm than for melody, $F(1, 236) = 14.91$, $p < .001$, partial $\eta^2 = .059$, as in a previous report with a sample recruited and tested similarly (Correia, Vincenzi, et al., 2022). There was no two-way interaction, $F < 1$. Melody and rhythm scores were correlated, $r = .521$, $p < .001$, as in the past (Bhatara et al., 2015; Correia, Vincenzi, et al., 2022; Swaminathan et al., 2021; Wallentin et al., 2010, Experiment 3). For the Gold-MSI (education held constant), there was no gender difference on the general factor, $p = .097$, or on any subscale after correcting for five tests (lowest corrected $p > .2$).

Validity of Self-Ratings

All correlations were calculated with gender and education held constant. As shown in Table 1, strong positive associations with Gold-MSI general factor and subscales provided evidence for the construct and content validity of the musicality self-ratings. The correlation with the general factor was particularly strong, with approximately half of the variance shared between variables. Comparisons of the magnitude of the associations between self-ratings and the five subscales[1] (corrected for 10 tests) revealed that correlations with Music Training, Singing Abilities, and Perceptual Abilities were stronger than the correlation with Emotions. The association between musicality self-ratings and years of music training was also strong and positive, $r = .412$, $p < .001$.

Other Correlates of Self-Ratings

Our question about whether musical self-awareness was associated with objective musical ability received positive support from a positive correlation with the melody subtest, $r = .359$, $p < .001$. There was no association with the rhythm subtest, $r = .066$, $p = .308$, however, and the correlation with melody was stronger than the correlation with rhythm, $p < .001$.

Associations between musicality self-ratings and nonmusical variables are provided in Table 2. After correcting for five tests, strong positive associations with personality were evident for openness and extraversion. As expected, there was no correlation between self-perceived musicality and cognitive ability. Cognitive ability was associated positively, however, with performance on the melody, $r = .269$, and rhythm, $r = .324$, subtests of the MET, *p*s $< .001$. To measure metacognitive accuracy, we calculated deviation (inaccuracy) scores by subtracting standardized MET melody scores from standardized self-ratings of musicality, such that positive and negative scores represented over and underestimates, respectively, relative to objectively measured ability. As predicted, a negative but modest association indicated that participants with lower levels of cognitive ability also tended to overestimate their musical ability, $r = -.190$, $p = .003$.

Aggregate Self-Ratings: Multivariate Analysis

Multivariate analysis used structural equation modeling, conducted with JASP (JASP Team, 2022), to analyze which variables independently predicted self-ratings of musicality, and whether the model provided a good fit to the data. The method of estimation was maximum likelihood with standard error calculation. The fit of the model was evaluated by way of a chi-square test, with evidence of adequate and good fits provided by confirmatory fit index (CFI) values of .90 and .95, and root-mean-square error of approximation (RMSEA) values of .10 and .60, respectively (Hu & Bentler, 1999).

The model, illustrated in Figure 1, included a latent variable for self-awareness of musical ability, extracted from four indicators (the measured self-ratings). Standardized factor loadings for the latent self-awareness variable ranged from .71 to .90 (*z*s > 11.32, *p*s $< .001$), indicating that each measured variable was a good indicator of the construct. Measured predictor variables included MET melody, MET rhythm, duration of music training, gender (men= 1, women = 0), education, openness, and extraversion. (MET-rhythm scores were included because of their theoretical importance.)

The model provided a good fit to the data, $\chi^2(23, N = 238) = 40.958$, $p = .012$, CFI $= .972$, RMSEA $= .057$, P(RMSEA $\leq 0.05 = .310$). All modification indices were below 5.0, which suggests that covariance among error terms was not substantial. All associations reported earlier remained significant (see Figure 1). Self-awareness was associated positively with MET melody (but not MET rhythm), duration of music training, gender (but not education), openness, and extraversion, even with all other predictors held constant.

Table 1

Partial Correlations Ordered From Strongest to Weakest, Between Aggregate Musicality Self-Ratings and Gold-MSI Scores (Gender and Education Held Constant)

Gold-MSI variable	*r*	*p*
General factor	.694	<.001
Music training	.595	<.001
Singing abilities	.583	<.001
Perceptual abilities	.566	<.001
Active engagement	.455	<.001
Emotions	.367	<.001

Note. Gold-MSI = Goldsmiths Musical Sophistication Index.

Table 2

Partial Correlations Between Aggregate Musicality Self-Ratings and Nonmusical Variables (Gender and Education Held Constant)

Nonmusical variable	*r*	*p*
Personality		
Openness	.274	<.001
Extraversion	.215	<.001
Conscientiousness	.144	.022
Neuroticism	−.137	.030
Agreeableness	.118	.060
Cognitive ability		
MaRs-IB	.033	.597

Note. MaRs-IB = Matrix Reasoning Item Bank.

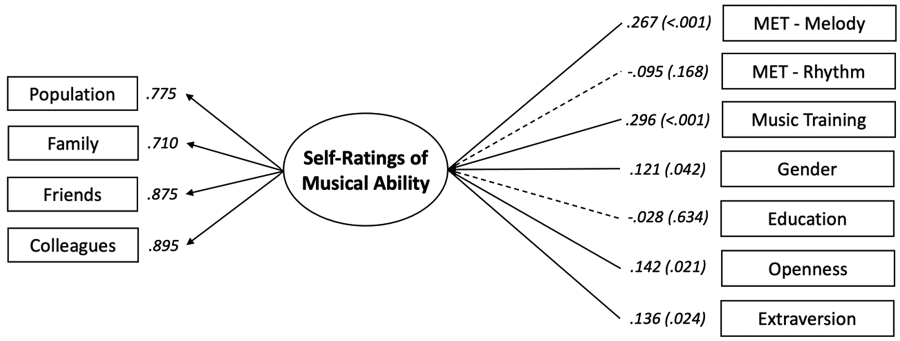
Discussion

We examined whether participants had accurate awareness of their musical ability, and whether such self-awareness was associated with other individual differences. Self-ratings of musicality were not associated with age, education, or general cognitive ability. Participants considered themselves to be above-average musically compared to their family and colleagues, but similar to their friends and the general population. Overestimates were also greater among men than women, and among individuals with lower cognitive abilities. Nevertheless, self-ratings of musicality correlated positively with self-reports collected by an established index of musical sophistication (Gold-MSI), and with performance on an objective test of melody perception and discrimination (MET melody). These

[1] Conducted with Psychometrica (https://www.psychometrica.de/correlation.html).

Figure 1

Results From a Structural Equation Model Used to Explain Self-Awareness of Musical Ability



Note. The circle represents a latent variable. Rectangles represent measured variables. Indicator and predictor variables are on the left and right, respectively. Numbers on the left indicate factor loadings. Numbers on the right indicate standardized slopes (*p* values in parentheses). Higher self-ratings were evident among participants with higher MET-melody scores and more years of music lessons, men, and individuals with higher scores on the personality traits openness-to-experience and extraversion. MET = Musical Ear Test.

findings suggest that individuals are indeed self-aware of some aspects of their musical ability. Musicality estimates were also correlated with openness and extraversion, the same personality traits that predict performance on the Gold-MSI (Lima et al., 2020).

The main finding of the present study was that self-ratings of musicality were positively correlated with all Gold-MSI scores and with MET-melody scores. Whereas the Gold-MSI measures musical expertise by way of 38 self-report items, the MET indexes musical ability objectively by way of a same-different discrimination task. Both measures have good psychometric properties (Lima et al., 2020; Müllensiefen et al., 2014; Swaminathan et al., 2021; Wallentin et al., 2010). Strong positive correlations with the Gold-MSI subscales and general factor provided evidence for the validity of our self-reports of musical ability. Individual differences in self-ratings, based on participant's intuitive notions of musicality, were correlated positively with aggregate musical-sophistication scores, as well as with the degree to which participants were actively engaged in music, self-reported music-perception abilities, their history of studying and playing music, self-reported singing abilities, and their emotional responses to music. In other words, self-ratings appeared to stem from broad conceptions of musicality, commensurate with scholars' conceptions, at least with those of Müllensiefen et al. (2014). Correlations were stronger for the Music Training, Perceptual Abilities, and Singing Abilities subscales than for the Emotions subscale, which suggests that intuitive notions of musicality are based more on the ability to perceive and perform music than they are on simply responding emotionally to music. After all, individuals with low levels of musical ability could still love music passionately.

The correlation with MET-melody scores provided evidence that associations with Gold-MSI scores were not merely reflective of individual differences in participants' self-esteem or social desirability, or other biases that can emerge in self-reports. Rather, self-ratings were also correlated with the relatively low-level perceptual abilities that are needed to determine whether one tone from a standard sequence is mistuned by as little as a semitone in a comparison sequence. Over years of musical experiences in social settings (e.g., singing *Happy Birthday* at a party, dancing at a club), our participants were likely to learn that some people are more musical than others (e.g., better singers or dancers), and, consequently, where they fit in the scheme of things, at least to some degree. The ability to judge one's own musical abilities accurately has practical implications. Inaccurate high or low estimations of self-ability could speciously encourage or discourage individuals, respectively, to engage in music-related activities, only to end up disgruntled, which might, in turn, negatively impact their self-concepts beyond musical expertise. To date, however, attempts to improve the accuracy of musical self-evaluations have not been particularly successful (Hewitt, 2010).

Although self-perceptions of musicality were associated positively with melody scores, even after accounting for gender, education, and personality, they were *not* associated with rhythm scores. These results do not prove the null hypothesis, but if there truly is an association between self-perceptions and rhythm, it is unlikely to be strong. As noted, differential response patterns for melody and rhythm mirrored those from large-sample studies that examined associations between music *training* and MET performance, either with in-person testing and English-speaking participants (Swaminathan et al., 2021), or online testing and romance-language speakers (i.e., from Italy, Portugal, Brazil; Correia, Vincenzi, et al., 2022). In any event, we now know that the ability to discriminate melodies is associated positively with participants' intuitive notions of their own musicality, as it is with music training, speaking a tone language (Swaminathan et al., 2018, 2021), and other musical experiences and behaviors (Correia, Vincenzi, et al., 2022). In principle, sampling bias could be implicated in the present results, although one would expect our study to appeal more to musically capable than incapable participants. In other words, sampling error is more likely to explain overestimates of musical ability, than it would a correlation with melody but not with rhythm.

In general, rhythm perception appears to be relatively independent of experiential factors but more strongly linked with stable *nonmusical* variables, such as general cognitive ability (Correia, Vincenzi, et al., 2022; Swaminathan et al., 2021), as well as language ability, including speech perception, grammar, and second-language ability (e.g., Bhatara et al., 2015; R. L. Gordon et al., 2015; Swaminathan & Schellenberg, 2017, 2020). Perhaps an association between rhythm and self-ratings of musical ability would emerge in musical cultures that place stronger emphasis on temporal dimensions (e.g., African drum music). One might also speculate that rhythm ability—and temporal perception more generally—is more hard-wired than melody ability, yet results from twin studies indicate that genetic contributions to melody and rhythm abilities are similar (Mosing et al., 2014). Future research could attempt to clarify these issues by including multiple measures of melody and rhythm ability, ideally administered longitudinally and with samples of participants recruited from different musical cultures and age groups.

Our evidence for the better-than-average effect is consistent with other comparative evaluations (Zell et al., 2020). But why was this effect evident in comparisons with family and colleagues, and not with friends and the general population? According to Social Comparison Theory (Festinger, 1954), individuals have an instinctive drive to judge their experiences and abilities by comparing themselves with others, especially when such abilities are difficult to evaluate objectively. Moreover, *downward comparisons* (considering others inferior) allow individuals to enhance their self-esteem and well-being (Wills, 1981). For musicians, social comparisons inform self-evaluations of performance (Denton & Chaplin, 2016). For our sample of mostly young-adult nonmusicians, comparisons with family were likely to involve consideration of parents, often deemed *uncool* in a general sense but particularly when music is involved. Colleagues, known but unlikely to be close friends, would have been of similar age to our participants but with varying musical tastes that mark their identities and personalities (Rentfrow & Gosling, 2006). In both instances, downward comparisons may have provided an easy, perhaps automatic means of enhancing self-efficacy and self-confidence (Bandura, 1977). Comparisons with the general population and friends differed because they involved total strangers and familiar peers, respectively. For the general population, it is unlikely that participants envisioned an "average person" that allowed for comparisons with the self, either downward or upward. Friends, by contrast, would likely involve in-group comparisons of individuals with equivalent status, at least on average.

As expected, men overestimated their musical abilities compared to women, although there was no gender difference in terms of objectively measured ability, or on the Gold-MSI general factor or any of its subscales. The comparative aspect of our music-ability questions may have increased the likelihood of a gender difference for our self-ratings, in contrast to the Gold-MSI, for which each item was evaluated absolutely in relation to the self (e.g., *I can tell when people sing or play out of time with the beat*). In a previous study, the gender gap in self-ratings was evident for a male-typed (math and science) task across a variety of contexts, yet it disappeared when the test involved a female-typed task that measured verbal skills (Exley & Kessler, 2022). Perhaps music is still considered to be a male-typed domain, as it has been historically (e.g., the Renaissance, Baroque, Classical, and Romantic eras), despite the abundance of women who are currently successful singers, musicians, and composers.

Self-ratings of musical abilities were associated with the personality traits openness and extraversion, but not with cognitive ability. As levels of openness and/or extraversion increased, so did self-ratings of musical ability. Open and extraverted individuals are likely to be comfortable exhibiting signs of their musical abilities in social situations, which would enhance comparisons with others. Although music training is associated more consistently with openness than it is with extraversion, correlations between Gold-MSI scores and both openness and extraversion were evident in an earlier study conducted in Portugal (Lima et al., 2020). Thus, associations between self-ratings of musicality and Gold-MSI scores appear to extend to *correlates* of the Gold-MSI. Regardless, associations with other predictor variables (gender, MET melody, and duration of music training) remained evident even after accounting for individual differences in openness and extraversion (see Figure 1).

Some limitations of the present study should be acknowledged. One is that we used a comparative measure of self-awareness: Participants judged their ability in comparison with others, which could be influenced by several factors (e.g., having musicians in the family and personality). Another is that objective musical ability was measured with a single test. In other words, future research is needed to confirm that the present findings are not measurement specific. Participants were also offered feedback about their musical ability as an incentive to participate, which may have skewed the sample by making it particularly appealing to those who had positive impressions about their own ability before agreeing to participate. Moreover, participants were acquaintances of master's students in psychology and may not be representative of the general population. Our self-ratings were also holistic—with musicality left undefined—which raises the possibility that different findings could emerge if participants were asked about more specific aspects of their musical ability. Finally, it would be interesting to explore the development of musical self-awareness, as well as motivations behind individuals' self-ratings of musicality (e.g., observations of music performances, feedback from friends or family, and personal experiences), which are known to play a role in musicians' and music students' self-efficacy concepts (Hendricks, 2016; Zelenak, 2020).

To conclude, our participants demonstrated self-awareness of their musical abilities that was commensurate with an established self-report measure of musical sophistication as well as with objectively measured abilities, provided these were pitch-based (melody scores) rather than time-based (rhythm scores). Self-ratings were not explained by cognitive ability, but they were associated with the personality traits openness and extraversion. They also tended to be exaggerated in general, and in particular by men and by participants with lower levels of cognitive ability. Future studies of musical self-awareness could ultimately improve our understanding of metacognitive abilities in general, and how they relate to the development of musical ability.

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