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Title:
Aspects of music performance that are most highly related to musical sophistication.

Date:
2020-06-01

Citation:
Zhang, J. D., Schubert, E. & McPherson, G. E. (2020). Aspects of music performance that are most highly related to musical sophistication.. Psychomusicology: Music, Mind, and Brain, 30 (2), pp.64-71. https://doi.org/10.1037/pmu0000252.

Persistent Link:
https://hdl.handle.net/11343/251873

Abstract

Over the last two decades, five skills relating to visual (Performing Rehearsed Music, Sight-reading), aural (Playing by Ear, Playing from Memory), and creative (Improvising) aspects of music performance have been defined and investigated. To date, however, there has been little research investigating the relationship between these five aspects of performance on general musicianship, and none using psychometric measures. The aim of this study was to empirically investigate this relationship through the use of the Goldsmiths Musical Sophistication Index (Gold-MSI). With the exception of 'Sight-reading', results show that all skills were correlated with musical sophistication, with the 'Playing by Ear' skill having the highest correlation (explaining 47.0 % of the variance). Further analysis with individual Gold-MSI subscales revealed specific interrelationships and attributions to Western art music-making practices. For example, the 'Performing Rehearsed Music' skill was predicted by the 'Musical Training', 'Emotions', and 'Singing Abilities' subscales; 'Playing by Ear' was predicted by the 'Active Engagement' and 'Singing Abilities' subscales; and 'Improvising' was predicted by the 'Active Engagement' subscale. Only 'Sight-reading' had no significant predictors. The implications for each skill towards current musical training methods is highlighted and discussed.

Introduction

Playing and performing music is naturally present within society and from birth, whether we are musicians or not (Hannon & Trainor, 2007; Trehub, 2008). Thus, it is unsurprising that the study of music performance has generated considerable interest, particularly for its underlying social and educational applications (Sloboda, 2000). Specifically, in the last two decades, there has been a significant increase in research concerning the relationship between various aspects of music performance (such as aural and improvisational skills) and musicianship, in parallel with discussions on key practices and limitations within music education (Dolan et al., 2018; Gabrielsson, 2003; Simones, 2017; Sloboda, 2000). Interestingly, there have been no studies that have explored the strength of correlations between these music performance skills and general musicianship using current psychometric measures.

McPherson (1995a, 1995b) introduced and defined music performance according to five forms of visual, aural and creative skills, namely: (i) Performing Rehearsed Music – the ability to reproduce notated music after multiple practice sessions; (ii) Sight-reading – the ability to perform previously unseen music; (iii) Playing from Memory – the ability to perform memorised notated music; (iv) Playing by Ear – the ability to perform music learnt aurally; and (v) Improvising – the ability to perform spontaneously and creatively. The initial study, which observed 101 high school instrumentalists and their music performance abilities, was motivated by a lack of existing research in understanding music performance in relation to the skills 'Playing from Memory, 'Playing by Ear', and 'Improvising' (McPherson, 1995a). Two key findings of this research were that: (a) practitioners focus on the skills 'Performing Rehearsed Music' and 'Sight-reading', which is the norm in many Western conservatorium traditions; and (b) the strength of correlations among the five skills strengthened "with increasing experience and musical maturity" (1995b, p. 120).

Since then, a number of research studies have affirmed these findings by emphasising the need to include the skills of 'Playing by Ear' and 'Improvising' within music education (see review by Azzara & Snell, 2016). This stems from a critique of Western art music-making as predominantly rote-learnt, revealing a neglect for aural-based learning and creativity in the music curricula. That is, much traditional Western music education involves the 'Performing Rehearsed Music' skill where rehearsing and then re-creating pre-existing notational score is seen as paramount (McPherson, 1995b; McPherson, Davidson, & Faulkner, 2012; Woody & Lehmann, 2010). In contrast, more 'mainstream' music practices such as jazz,

popular, and world music are driven in part at least by aural transmission, observation and imitation, and improvisation (McPherson, 1995b; Musco, 2010; Woody & Lehmann, 2010).

The motivations behind the call for greater 'Playing by Ear' and 'Improvising' skills are supported by research claiming that both skills impact on the strengthening and development of other musical skills as well as overall musicianship. For example, McPherson, Bailey, and Sinclair (1997) and McPherson and Gabrielsson (2002) claim that the skill of 'Playing by Ear' is the most foundational music skill given that it has been found to contribute to the other four music performance skills through an emphasis on developing ear to hand coordination. Playing by ear is also believed to contribute to musical aptitude and musicianship (Musco, 2010; Woody, 2012). Similarly, improvisational ability is considered a key component to the holistic view of musicianship (Azzara & Snell, 2016; Campbell, 2009; Higgins & Mantie, 2013). One way to understand the role of improvisation and other musical skills upon the construct of 'being a musician' is to compare these skills through the lens of 'musical sophistication'. However, no research study has empirically investigated the five music performance skills alongside such measures in the literature.

The Goldsmiths Musical Sophistication Index (Gold-MSI) measures 'musical sophistication' using five subscales, namely 'Active Engagement', 'Perceptual Abilities', 'Musical Training', 'Singing Abilities', and 'Emotions'. It is defined as 'a psychometric construct that can refer to musical skills, expertise, achievements, and related behaviours'. In particular, it embraces a multi-faceted view of musical expertise by recognising a wide range of exposure and implicit learning habits in Western society (Müllensiefen, Gingras, Musil, & Stewart, 2014). Musical sophistication can therefore be viewed alongside musicianship, as it not only acknowledges traditional learning environments, but also the underlying perceptual, theoretical, and conceptual abilities that can result from other forms of exposure. Gold-MSI is a well-established and reliable measure which can be used to test the relationship between each music performance skill and musical sophistication, especially in a Western music environment (Lima, Correia, Müllensiefen, & Castro, 2018; Schaal, Bauer, & Müllensiefen, 2014). This is further supported by reports of high correlations between the five Gold-MSI subscales with the self-reported items on music performance abilities and skills in the Musical Engagement Questionnaire (Müllensiefen et al., 2014; Werner, Swope, & Heide, 2006); it has been asserted that high levels of musical sophistication can be

characterised by "higher frequencies of exerting musical skills or behaviours" (Müllensiefen et al., 2014, p. 2).

With the above as context, the aim of this study was to investigate the relationship between the five music performance skills and measures of musicianship using the Gold-MSI. We expected that all five skills would be highly correlated with musical sophistication. In addition, given views supporting the skills 'Playing by Ear' and 'Improvising' with overall musicianship, we hypothesised a greater correlation for these two skills. Similarly, given the circumstances in Western art music methods, we also expected weak relationships between the abilities of 'Playing by Ear' and 'Improvising' with musical training.

Method

Participants

Eighty-five individuals (M = 20.8 years, *SD* = 1.9 years; range = 18-28 years; *n* = 51, female) participated in the survey in exchange for course credit. All participants had played an instrument in the last 12 months, and were recruited from a course containing a wide range of university students. Ethics approval to conduct the research was provided by the University Human Research Ethics Committee, approval code HC13015.

Materials

A survey was created using KeySurvey (http://www.worldapp.com/surveys/overview.html) consisting of the Goldsmiths Musical Sophistication Index (v1.0), the five measures of music performance, and demographic questions. For this study, the original music performance skills were modified into self-report items using the seven-point scale also used in Gold-MSI (*i.e.* from 1 = Completely Disagree to 7 = Completely Agree) (McPherson, 1995a): (i) 'Performing Rehearsed Music' became 'No matter how much I practice a piece of music I still have problems performing it'; (ii) 'Sight-reading' became 'I am very bad at 'sight-reading' – that is, I am not good at reading a new piece of music and performing it straight away'; (iii) 'Playing from Memory' became 'I can easily play or sing music that I know well (without any written music, all by memory)'; (iv) 'Playing by Ear' became 'I am able to play/sing music as I hear it. That is, I can 'play by ear''; and (v) 'Improvising' became 'I like to make up my own tunes'. We constructed two of the music performance skill items (namely, items iii and iv, both from the 'Singing Abilities' subscale)

so that they could be directly compared with items already contained within Gold-MSI to allow for validity checking.

Validity of music performance skills

Pearson correlation tests were performed for the music performance skill items that were similarly represented in the Goldsmiths Musical Sophistication Index (*i.e.* 'Playing from Memory' and 'Playing by Ear'). 'Playing from Memory' was correlated with the Gold-MSI item 'I can sing or play music from memory' ($r = 0.786$, $p < 0.001$), and 'Playing by Ear' was correlated with the Gold-MSI item 'After hearing a new song two or three times, I can usually sing it by myself' ($r = 0.636$, $p < 0.001$). These results provided evidence for the validity of the music performance skills items.

Procedure

All participants were asked to complete the survey in their own time. To account for the possibility of collinearity between the two music performance items and their respective Gold-MSI representatives (discussed above), we removed these two Gold-MSI items from the responses prior to subsequent analysis. That is, the 'Singing Abilities' subscale of Gold-MSI only contained 5 items instead of 7. The overall Gold-MSI (*i.e.* the sum of all Gold-MSI items) and subscale scores (*i.e.* the sum of items in a given subscale) were then calculated using the Gold-MSI All Items Scoring Template v1.0 supplied online (http://www.gold.ac.uk/music-mind-brain/gold-msi/download). Negatively loading items for the music performance skills, 'Performing Rehearsed Music' and 'Sight-reading' had the scale reversed such that a response of 1 would score 7 *etc*. All question items in the survey were presented in a random order to reduce systematic bias (Siminski, 2006).

Results and Discussion

Multiple ordinary least squares linear regressions were used to determine which predictor variable or Gold-MSI subscale (*i.e.* 'Active Engagement', 'Perceptual Abilities', 'Musical Training', 'Emotions', and 'Singing Abilities') best explained each of the five music performance skill dependent variables: (i) Performing Rehearsed Music; (ii) Sight-reading; (iii) Playing from Memory; (iv) Playing by Ear; and (v) Improvising. A separate analysis of the Gold-MSI data has been reported elsewhere (Zhang & Schubert, 2019). The results comparing Gold-MSI with the five music performance skills are summarised in Table 1. Linear regressions were also calculated to predict overall Gold-MSI score based on each performance

skill alone. For the purposes of the statistical analysis reporting, all rating items were treated as interval data, as argued by Carifio and Perla (2008).

Performing Rehearsed Music

The regression model for 'Performing Rehearsed Music' explained 20.6 % of variance, $F(1,83) = 21.573$, $p < 0.001$ (Figure 1). Results showed a number of significant Gold-MSI predictor variables in explaining the dependent variable, 'Performing Rehearsed Music': 'Musical Training' ($\beta = -0.249$, $p = 0.029$, VIF = 1.608), 'Emotions' ($\beta = 0.263$, $p = 0.038$, VIF = 1.964), and 'Singing Abilities' ($\beta = 0.287$, $p = 0.034$, VIF = 2.255) (Table 1). This can be explained by the definition of performing rehearsed music as the ability to accurately execute a variety of skill-sets, namely in pitch, rhythm, slurring/articulation, tempo, expression, pause/fermata and repeats (McPherson, 1995a). Thus, some degree of musical training is needed to play music with appropriate accuracy in pitch, rhythm, tempo *etc*. More importantly, this requires a high level of engagement in musical practice (McPherson, 2005). These ideas are represented in items such as 'I engaged in regular, daily practice of a musical instrument (including voice) for _ years' and 'I have had _ years of formal training on a musical instrument (including voice) during my lifetime' in the 'Musical Training' subscale of Gold-MSI. This result is also consistent with literature demonstrating a strong relationship between performing rehearsed music and instrumental practice and lessons (McPherson, 1995a). Similarly, in order to perform music with 'expression', some knowledge of the emotions found within a musical piece is needed. This aligns with current Western music practices as heavily situated in recognising the expressive qualities in music (Fabian, Timmers, & Schubert, 2014; Juslin & Timmers, 2010). This idea can be found in the following items in the 'Emotions' subscale: 'I am able to identify what is special about a given musical piece' and 'I am able to talk about the emotions that a piece of music evokes for me'. Moreover, an ability to internally memorise musical features in order to re-create them in performance would also be needed. This can be found in the item 'I can sing or play music from memory' in the 'Singing Abilities' subscale.

Sight-reading

The regression model for 'Sight-reading' explained 11.6 % of variance, $F(1,83) = 10.877$, $p = 0.001$ (Figure 2). There were no significant Gold-MSI predictor variables for 'Sight-reading' (Table 1). Although none of the Gold-MSI items ask for 'sight-reading' ability, a relationship with the 'Musical Training' subscale of Gold-MSI would have been plausible, given that the ability to sight-read music

implies some knowledge of basic music theory (*e.g.* time and key signature, rhythm values, musical notes) (McPherson, 2005). However, a lack of relationship seems to suggest a more specific role that sight-reading has in present-day music-making. Sight-reading is considered an independent skill that is not enabled by talent. Instead, it is a product of extended training, experience and knowledge of music repertoire (Lehmann & McArthur, 2002). That is, acquiring expertise in sight-reading is based on individual motivations. For example, sight-reading is more applicable for piano accompanists or some Western art musicians where the skill of quickly learning a wide variety of music is important. Moreover, a relatively low correlation between 'Sight-reading' skill and overall Gold-MSI score (Figure 2) supports the claim that a strong relationship between sight-reading and other musical activities would be unlikely (Lehmann & McArthur, 2002). In sum, this finding supports the view that performing rehearsed music is a tradition that became established in Western art-music cultures in the nineteenth century, and deeply engrained in traditional Western music conservatorium teaching, neglecting other skills that have a greater bearing on overall musicianship.

Playing from Memory

The regression model for 'Playing from Memory' explained 34.7 % of variance, $F(1,83) = 44.148$, $p < 0.001$ (Figure 3). The 'Perceptual Abilities' subscale ($\beta = 0.431$, $p = 0.004$, VIF = 3.001) was the only significant Gold-MSI predictor variable for the dependent variable 'Playing from Memory' (Table 1). The relationship with the 'Perceptual Abilities' subscale can be attributed to the representation of items relating to an internal memorising ability, namely: 'I usually know when I'm hearing a song for the first time' and the reverse scored item 'I have trouble recognizing a familiar song when played in a different way or by a different performer'. In addition, the relatively high correlation between 'Playing from Memory' and overall Gold-MSI score (Figure 3) suggests a strong relationship between memory ability and musical sophistication.

Playing by Ear

The regression model for 'Playing by Ear' explained 47.0 % of variance, $F(1,83) = 73.570$, $p < 0.001$ (Figure 4). Only the 'Active Engagement' subscale was a significant Gold-MSI predictor for 'Playing by Ear' ($\beta = 0.294$, $p = 0.018$, VIF = 2.379) (Table 1). Interestingly, a relationship with 'Active Engagement' suggests that aural development can stem from participation with music beyond learning the required musical score. This can be seen in items such as: 'I'm intrigued by musical styles I'm not familiar with and

want to find out more', 'I keep track of new music that I come across (e.g. new artists or recordings)', and 'I listen attentively to music for __ per day.' In addition, a relatively high correlation between 'Playing by Ear' with overall Gold-MSI score (Figure 4) also suggests a close relationship between aural capacity and musical sophistication.

Improvising

The regression model for 'Improvising' explained 33.2 % of variance, $F(1,83) = 41.185$, $p < 0.001$ (Figure 5). The 'Active Engagement' subscale of Gold-MSI was found to be a significant predictor for the dependent variable 'Improvising' ($\beta = 0.439$, $p = 0.002$, VIF = 2.379; Table 1). This can be attributed to the inclusion of the item, 'I spend a lot of my free time doing music-related activities' in 'Active Engagement', where music-related activities could include the act of improvising. In addition, the results suggest that an inclination to improvise can stem from a motivation to actively engage and broaden one's musical understanding. This is important because comprehensive knowledge of repertoire develops and inspires musical creativity (Azzara & Snell, 2016). Thus, items such as 'I'm intrigued by musical styles I'm not familiar with and want to find out more', 'I keep track of new music that I come across', 'I have attended _ live music events as an audience member in the past twelve months', and 'I listen attentively to music for _ per day' can all contribute to improvising ability. Moreover, a relatively high correlation between 'Improvising' skill and overall Gold-MSI score (Figure 5) is in line with literature views which indicate that an increase in improvisatory skill is related to overall musicianship (see Introduction).

Implications

The correlations between Gold-MSI and each of four (out of five) music performance skills provide partial support for the hypothesis that each skill is correlated with musical sophistication. We found evidence to suggest that the skills 'Performing Rehearsed Music', 'Playing from Memory', 'Playing by Ear', and 'Improvising' are correlated with musical sophistication, and that the two concepts of musicianship and musical sophistication are closely connected. In particular, 'Playing by Ear' showed the highest correlation with musical sophistication, which suggests that aural ability is the most closely aligned skill to musicianship because of its contribution to the other four music performance skills, as asserted by McPherson (1995a, 1995b) and McPherson et al. (1997).

For both 'Playing by Ear' and 'Improvising' skills, there was a weak relationship with the 'Musical Training' subscale, but a significant relationship with the 'Active Engagement' subscale of the Gold-MSI. This result supports current views within Western art music teaching practices where both learning by ear and improvisatory skills are often neglected (see Introduction). Instead, both skills seem to have developed from an active engagement with music outside of the curriculum, *e.g.* actively listening to or engaging with music. Nevertheless, the high correlations between musical sophistication and musicianship provide further evidence for those who believe in the importance of including improvisatory and aural exercises within their teaching, plus also, encouraging participation of extra-curricular musical activities. Improvisation, in particular, integrates multiple skills such as music theory, performing, listening, and creating, all of which supports a holistic background of musical training that may develop an ability to express and communicate musical ideas more clearly (Azzara & Snell, 2016; Campbell, 2009). The regression analyses were robust, with individual predictors contributing reasonably independently to the dependent variable or all models, as evidenced by the variance inflation factor diagnostics (VIF; Table 1) which were all well within the recommended range for acceptable multicollinearity (O'Brien, 2007).

Limitations

This study applied a simple analytic approach to address the question of how being a musician is related to each of the five basic skills of music performance. Our approach consisted of constructing five multiple linear regression models using the subscales of an established psychometric measure of musical sophistication as predictors (independent variables) for each of the five skills (dependent variables), and hence five separate regression models. Although we validated each model by assessing the variance inflation factor (finding them to be well withint the recommended guidelines in all five cases), we nevertheless acknowledge that the five regression equations are not necessarily independent of one another, and that futher investigation using more sophisticated, multivariate statistical techniques should be considered. Furthermore, the reliability of the measures may benefit from repeating the data collection phase, to allow for test-retest reliability analysis of the effects we have discovered.

Conclusions

In this study, an empirical investigation was conducted to observe how five skills relating to visual (Performing Rehearsed Music, Sight-reading), aural (Playing from Memory, Playing by Ear) and creative (Improvising) music performance skills relate to musical sophistication through the use of psychometric

measures. An analysis of these skills with the Goldsmiths Musical Sophistication Index revealed significant correlations between overall musical sophistication score and each of four (out of the five) skills. Thus, all music performance skills with the exception of the 'Sight-reading' skill are linked to musical sophistication, and by extension, musicianship. In particular, 'Playing by Ear' displayed the strongest relationship with musical sophistication, thereby supporting views in the literature where aural ability significantly contributes to overall musicianship (see Introduction). The strong correlation could reflect the more intrinsically musical nature of playing without the use of graphemic notation, the latter being more focused on the 'external referent' (the note-reading process), potentially detracting attentional resources from the act of music making (Thompson & Lehmann, 2004).

Each of the four skills were also significant predictors of at least one subscale of the Gold-MSI. These results could be understood in terms of priorities in skill teaching found in Western art music-making. For example, the 'Performing Rehearsed Music' skill was significantly related to the 'Musical Training' and 'Emotions' subscales, showing an emphasis on the ability to perform expressively pre-existing score in Western music practices. In such cultures, the performer can focus on emotional/expressive aspects of a performance when the tonal-rhythm combinations are set by the musical score. In contrast, a lack of relationship between each of the 'Playing by Ear' and 'Improvising' skill with 'Musical Training' may be related to a neglect of such skills in the Western art-music curricula. Given current views on the importance of these two skills upon musicianship, this study provides further support for why they need to be included in musical training. The surprising result that sight-reading is not predicted by musical sophistication could be explained in terms of an underlying low relevance of sight-reading with musical sophistication.

This is the first study to investigate the relationships between well-established music performance skills with newly-established measures of musical sophistication. Further studies investigating practice-based skills with assumed aspects of musical identity are therefore needed to corroborate and extend such findings. Observing how these relationships may change for the more 'mainstream' music population, for example, will help to explain why playing music by ear is so closely tied to musical sophistication while sight-reading plays no discernable role. Future studies could augment the findings of the present study by collecting observational and skill execution assessment data of music-related activities rather than self-reported, retrospective assessment of skill-based variables (see, e.g. McPherson, 2005). Crucially, these

results suggest that each music performance skill is reciprocally shaped by certain aspects of musical sophistication. Thus, future research that interrogates why playing by ear is most strongly related to musical sophistication, and in contrast why sight-reading ability is the least strongly related, would be of considerable interest.

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Table 1. Descriptive statistics, Pearson product-moment correlations and multiple linear regression standardised coefficients for music performance skill predictors with five Gold-MSI subscale models.

	Performing Rehearsed Music	Sight-reading	Playing from Memory	Playing by Ear	Improvising	Mean (Standard Deviation)	Range
Active Engagement	β = 0.062 *t* = .453 *p* = 0.651 sr^2 = 0.003	β = 0.000 *t* = -0.001 *p* = 0.999 sr^2 = 0.000	β = 0.147 *t* = 1.148 *p* = 0.254 sr^2 = 0.016	β = 0.294* *t* = 2.405 ***p* = 0.018** sr^2 = 0.068	β = 0.439** *t* = 3.214 ***p* = 0.002** sr^2 = 0.116	42.01 (9.04)	9 – 63
Perceptual Abilities	β = 0.220 *t* = 1.431 *p* = 0.156 sr^2 = 0.025	β = 0.139 *t* = 0.768 *p* = 0.445 sr^2 = 0.007	β = 0.431** *t* = 2.994 ***p* = 0.004** sr^2 = 0.102	β = 0.108 *t* = 0.787 *p* = 0.434 sr^2 = 0.008	β = 0.087 *t* = 0.567 *p* = 0.573 sr^2 = 0.004	43.89 (6.85)	9 – 63
Musical Training	β = -0.249* *t* = -2.219 ***p* = 0.029** sr^2 = -0.059	β = 0.056 *t* =0.422*p* = 0.674 sr^2 = 0.002	β = -0.146 *t* = -1.390 *p* = 0.169 sr^2 = -0.024	β = 0.050 *t* = 0.498 *p* = 0.620 sr^2 = 0.003	β = -0.022 *t* = -0.196 *p* = 0.845 sr^2 = -0.000	33.19 (9.04)	7 – 49
Emotions	β = 0.263* *t* =2.114 ***p* = 0.038** sr^2 = 0.053	β = 0.061 *t* = 0.412 *p* = 0.681 sr^2 = 0.002	β = 0.035 *t* = 0.299 *p* = 0.766 sr^2 = 0.001	β = 0.195 *t* = 1.756 *p* = 0.083 sr^2 = 0.038	β = 0.030 *t* = 0.243 *p* = 0.808 sr^2 = 0.000	33.21 (4.32)	6 – 42
Singing Abilities	β = 0.287* *t* =2.155 ***p* = 0.034** sr^2 = 0.056	β = 0.179 *t* = 1.140 *p* = 0.258 sr^2 = 0.016	β = 0.233 *t* = 1.872 *p* = 0.065 sr^2 = 0.042	β = 0.223 *t* = 1.873 *p* = 0.065 sr^2 = 0.042	β = 0.157 *t* = 1.179 *p* = 0.242 sr^2 = 0.017	23.25 (5.58)	5 – 35
VIF	2.379	3.001	1.608	1.964	2.255		
Performing Rehearsed Music		*r* = 0.259*	*r* = 0.554**	*r* = 0.393**	*r* = 0.328**	3.99 (1.62)	1 – 7
Sight-reading			*r* = 0.109	*r* = 0.097	*r* = 0.177	3.85 (1.79)	1 – 7
Playing from Memory				*r* = 0.665**	*r* = 0.476**	5.07 (1.52)	1 – 7
Playing by Ear					*r* =0.457 **	4.31 (1.71)	1 – 7
Improvising						4.69 (1.43)	1 – 7

Note:

* $p < .05$

** $p < .01$

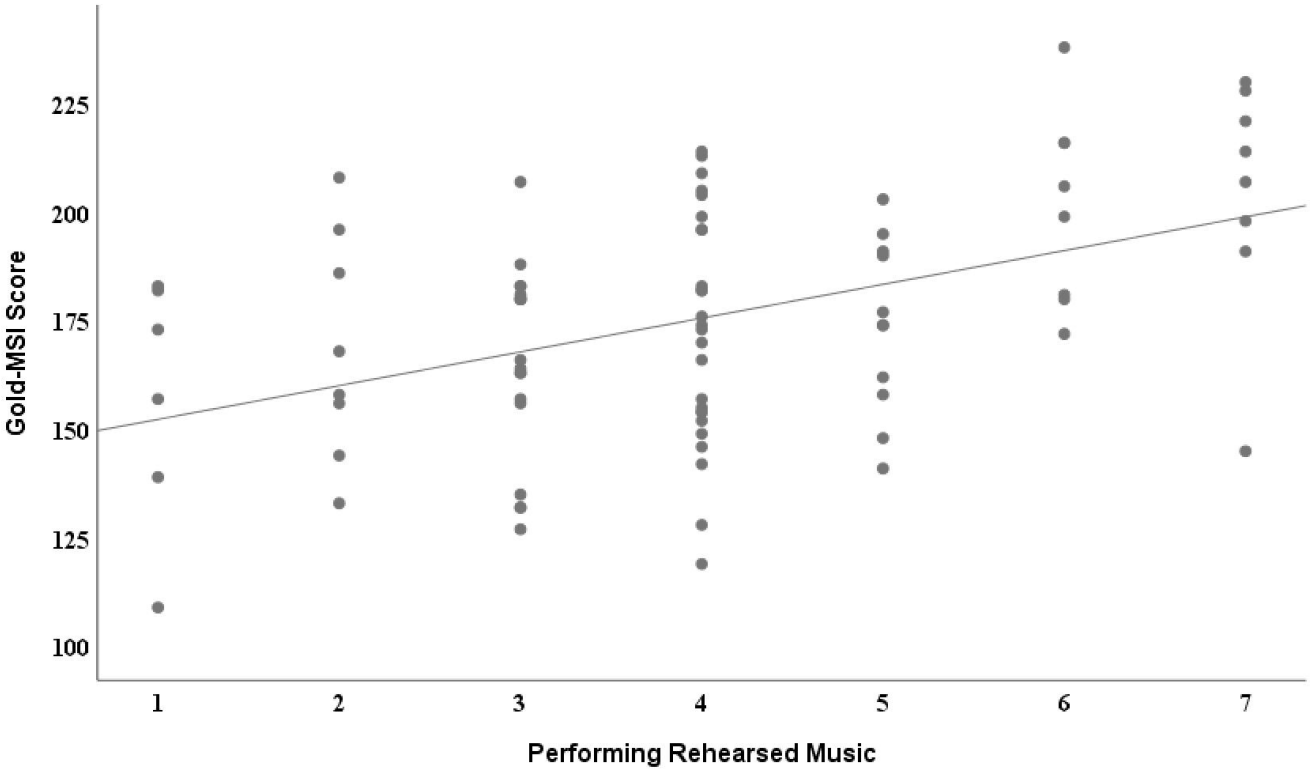


Figure 1. Plot of overall Gold-MSI score according to the self-rated 'Performing Rehearsed Music' skill. The regression model explained 20.6 % of variance, $F(1,83) = 21.573$, $p < .001$.

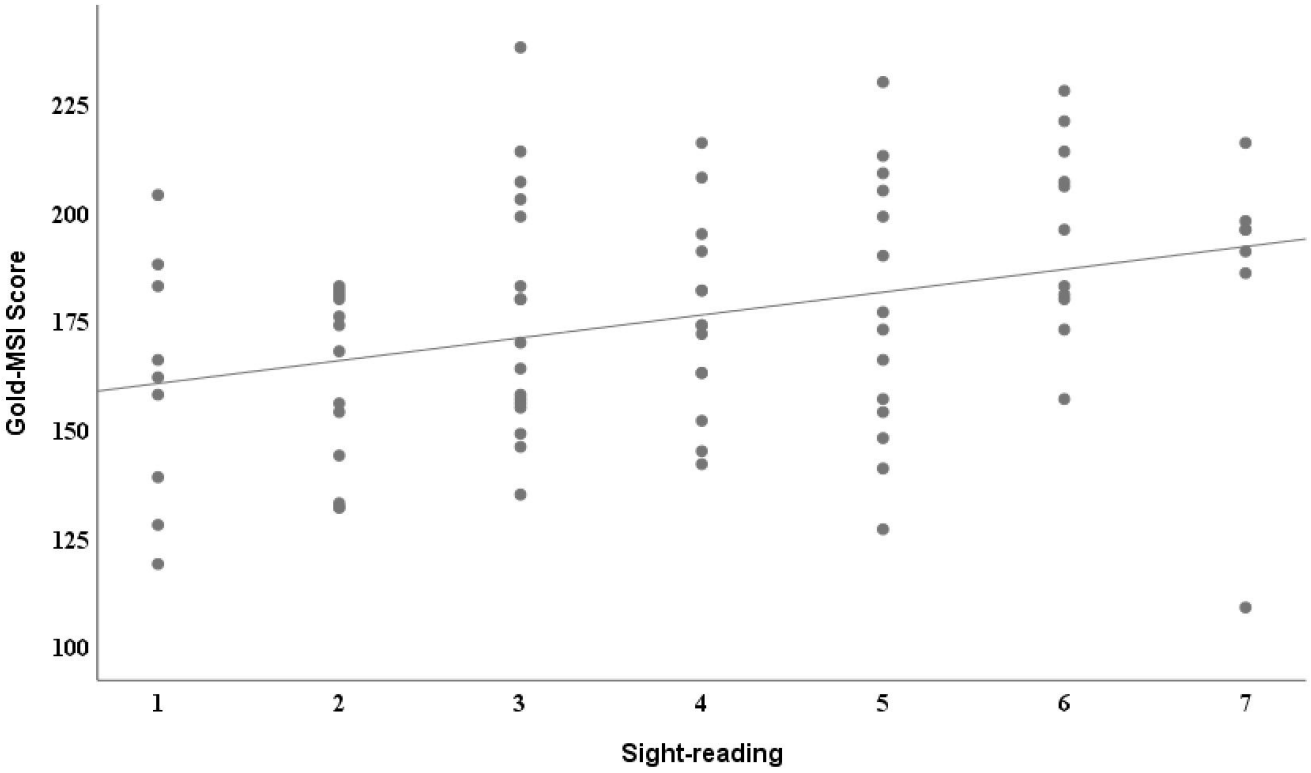


Figure 2. Plot of overall Gold-MSI score according to the self-rated 'Sight-reading' skill. The regression model explained 11.6 % of variance, $F(1,83) = 10.877$, $p = .001$.

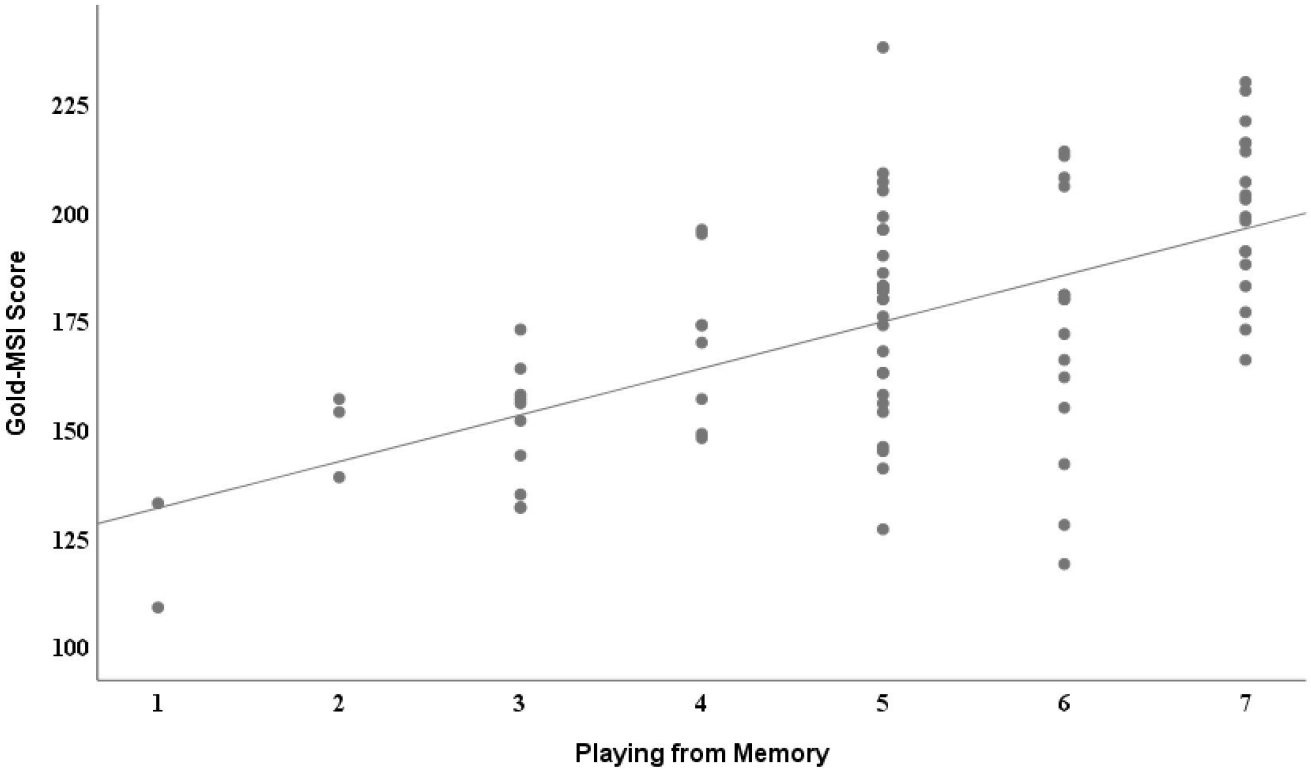


Figure 3. Plot of overall Gold-MSI score according to the self-rated 'Playing from Memory' skill. The regression model explained 34.7 % of variance, $F(1,83) = 44.148$, $p < .001$.

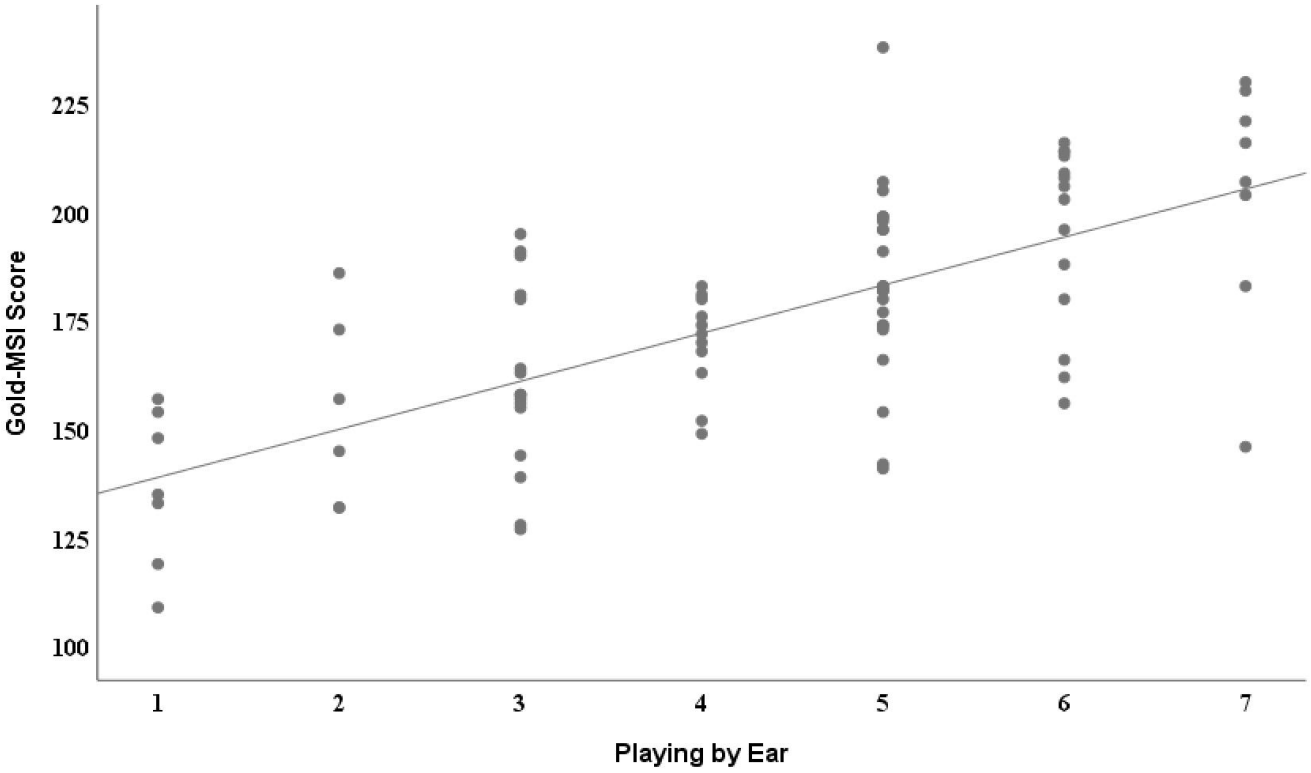


Figure 4. Plot of overall Gold-MSI score according to the self-rated 'Playing by Ear' skill. The regression model explained 47.0 % of variance, $F(1,83) = 73.570$, $p < .001$.

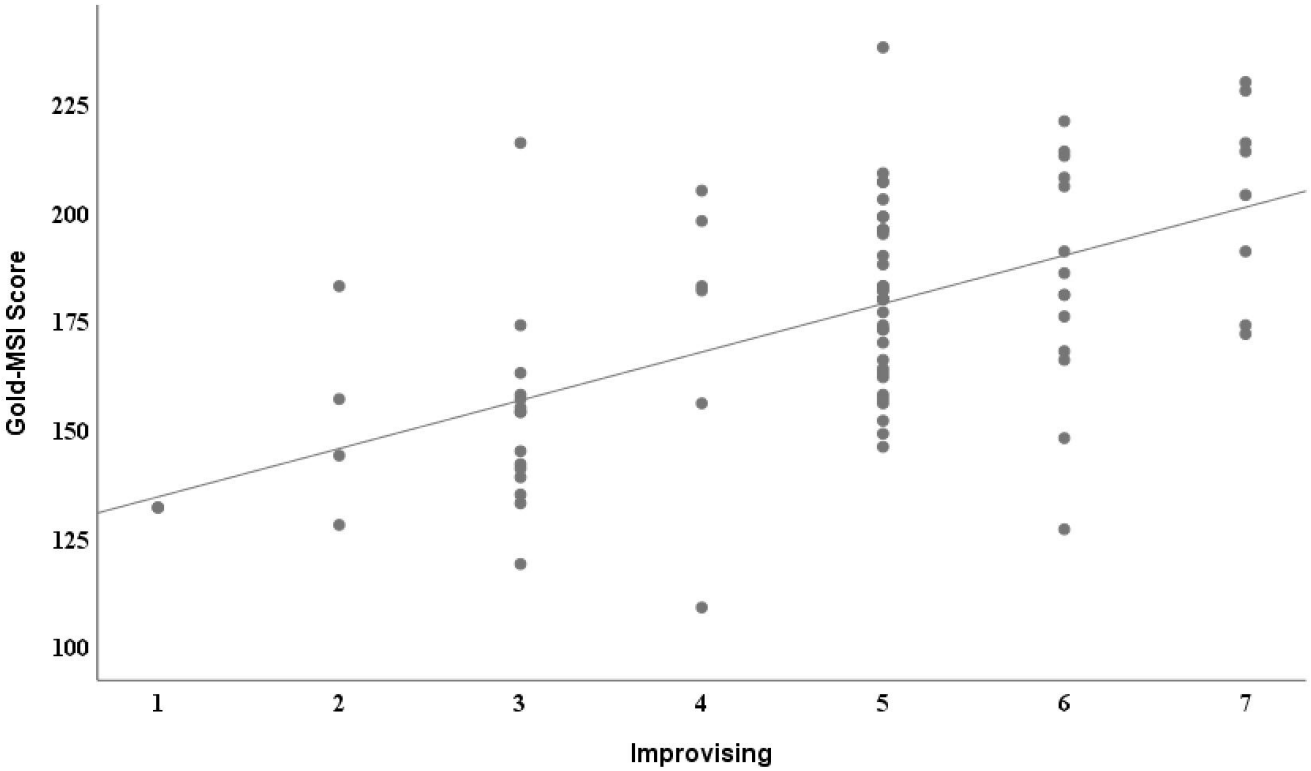


Figure 5. Plot of overall Gold-MSI score according to the self-rated 'Improvising' skill. The regression model explained 33.2 % of variance, $F(1,83) = 41.185$, $p < .001$.