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What Does It Take to Flow? Investigating Links between Grit, Growth Mindset and Flow in Musicians

Abstract:	While it may seem effortless for great musicians to deliver beautiful works of art, little is known about the hard work behind these performances. Musicians require grit to sustain effort over many years of training but flow can sweeten this experience. Growth mindset, referring to the belief that ability is malleable, is often related to grit and has been theorised to be conducive to flow. Self-identified musicians, between 18 and 57 years of age (N = 162), participated in an online survey investigating the potential links between grit, growth mindset and dispositional flow. Correlational analyses revealed that grit was a significant predictor of flow but no correlations between growth mindset and grit or flow were found. Furthermore, a hierarchical regression analysis taking into account participants' musical training, personality traits and performance anxiety found that grit did not predict dispositional flow over and above what can be predicted by practice hours and music performance anxiety. Altogether, these findings offer a closer look at the effects of the non-cognitive factors of growth mindset and grit on the experience of flow in music performance.

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Introduction

Most of us have, at some point in our life, experienced moments of flow where we find ourselves fully absorbed in what we are doing, whether it is reading, running or listening to our favourite music. Csikszentmihalyi (2000) described the flow experience as "the holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi, 1975, p.36). The state of flow is a positively-valenced experience because it is intrinsically rewarding, while simultaneously, one may be at the peak of one's performance in the chosen activity (Csikzentmihalyi, 1990). Indeed, the flow state is characterised by high intrinsic motivation - the engagement in an activity for its own sake or the pleasure and satisfaction derived from the experience but not for some external goal (Ryan & Deci, 2000). Therefore, it is not surprising that flow experience may provide a strong incentive for developing skills, facilitating the engagement with challenging performance-based activities. Indeed, studies have found that activities such as sports (Muzio, Riva, & Argenton, 2012; Swann, Keegan, Piggott, & Crust, 2012) and music-making/learning(MacDonald, Byrne, & Carlton, 2006; O'Neill, 1999; Wrigley & Emmerson, 2013) are frequented with flow experiences. The dispositional tendency to experience flow is referred to as flow proneness, or dispositional flow (Ullén, de Manzano, et al., 2012). The aim of this study is to take a closer look at how non-cognitive skills like grit and growth mindset may be related to dispositional flow in musicians.

Grit, defined as 'perseverance and passion for long term goals' (Duckworth, Peterson, Matthews, & Kelly, 2007), is a noncognitive trait that is aligned with Galton's concept of hard labour and passion (Galton, 1892) exhibited by successful individuals who keep going even when the going gets tough and rough (Cox, 1926). Grit demonstrates some predictive validity for achievement of goals (Akos & Kretchmar, 2017; Duckworth et al., 2007; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014), especially those that are personally relevant and that require a long-term commitment. For example, a recent study (Duckworth et al., 2019) has showed that grit is the strongest predictor of completing an intensive military summer training often associated with a high attrition rate. Grit is also a significant predictor of flow proneness and practice efficiency in musicians (Miksza & Tan, 2015). Miksza and Tan (2015) suggest that gritty musicians practiced more, increasing in skill and becoming more likely to perceive a balance between the challenge of the situation and their skill level, an important prerequisite of flow. This is supported by the finding that amount of practice predicted the likelihood of experiencing flow during performance in highly trained pianists (Marin & Bhattacharya, 2013).

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Another non-cognitive trait contributing positively towards encouraging the investment of hard work in the practice of music is growth mindset (Davis & Persellin, 2017), which refers to the belief that an individual's abilities (e.g., intelligence, personality, talent) can be improved through effort (Dweck, 2006), right strategies and good mentoring (Dweck, 2014). A fixed mindset, on the other hand, refers to the implicit belief that one's potential is decided and cannot be improved further. A growth mindset would lead one to pursue challenging learning opportunities, in the hope of growing in knowledge or experience as one would treat setbacks, not as obstacles, but instead as opportunities to overcome. Growth mindset may thus help cultivate grit, as individuals with a growth mindset are more likely to pursue long-term goals despite setbacks. Moderate positive correlations have been found between grit and growth mindset in the context of academic performance (Wang et al., 2018; Yeager et al., 2016; Zhao et al., 2018)

In addition to a resilience to failure, a growth mindset is also conducive to intrinsic motivation. Learners with a growth mindset are more likely to be intrinsically motivated because they are focused on learning and the value placed on skill development (Aronson, Fried, & Good, 2001; Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013). In fact, a growth mindset intervention has recently been shown to increase intrinsic interest in the subject being taught (Burnette et al., 2020). On the other hand, a fixed mindset impedes intrinsic motivation (Aronson et al., 2001; Cury, Elliot, Da Fonseca, & Moller, 2006; Haimovitz, Wormington, & Corpus, 2011). As flow is a state of high intrinsic motivation, a growth mindset may facilitate the experience of flow. Intrinsic motivation has also been found to mediate the relationship between grit and growth mindset (Zhao et al., 2018). Compared to extrinsic motivation, intrinsic motivation is more likely to lead to persistence and a better quality of engagement in the activity (Ryan & Deci, 2000).

Grit and growth mindset also share similarities to concepts that have already been found to correlate with flow. Growth mindset overlaps with the concept of an internal locus of control (LOC) or the idea that outcomes are contingent on work and effort, rather than luck or factors out of one's control (Rotter, 1966).An internal locus of control has been linked to increased flow proneness in work, leisure, sports, and everyday activities (Mikicin, 2007; Mosing, Pedersen, et al., 2012; Taylor, Schepers, & Crous, 2006). High internal LOC individuals may be sensitive to factors within their control and thus are sensitive to high-challenge, high-skill situations where flow is likely to occur (Keller & Blomann, 2008). Both grit and growth mindset are positively correlated with an internal locus of control (Burgoyne, Hambrick, Moser, & Burt, 2018). Believing that one is able to take action to achieve the

desired outcome, or having high self-efficacy, is linked to higher persistence in acquiring skills as well as more flow experience (Mesurado, Cristina Richaud, & José Mateo, 2016; Pineau, Glass, Kaufman, & Bernal, 2014). Grit also correlates with self-efficacy (Oriol, Miranda, Oyanedel, & Torres, 2017). The close links between growth mindset, grit and concepts related to flow, such as intrinsic motivation and internal locus of control, suggest that growth mindset is likely to correlate with both grit and dispositional flow in musicians.

But how important are non-cognitive factors like grit and growth mindset compared to other factors have been found to relate to dispositional flow in musicians? Unsurprisingly, personality plays a role. People who are more open to experience, emotionally stable, extraverted and conscientious are more likely to experience flow (Butkovic, Ullén, & Mosing, 2015; Gözmen & Aşçı, 2016; Hager, 2015; Heller, Bullerjahn, & Von Georgi, 2015; Ullén et al., 2012). Music performance anxiety reduces the tendency to experience flow during music playing (Cohen & Bodner, 2019a, 2019c; Fullagar, Knight, & Sovern, 2013). Further, the amount of daily practice has also been found to correlate positively with the dispositional flow in pianists and singers (Heller et al., 2015; Marin & Bhattacharya, 2013). By also measuring these previously studied factors in our sample of musicians, we can test if non-cognitive factors like grit and growth mindset explain any variance in dispositional flow over and above these previously studied variables.

And finally, grit and flow may be more likely to be expressed for individuals who are highly trained in music. As higher scores of global dispositional flow were found in professional classical orchestral musicians, compared to those previously found in student musicians (Marin & Bhattacharya, 2013; Wrigley & Emmerson, 2013), it is suggested that professional musicians' higher skill levels may allow them to experience the challenge-skill balance prerequisite of flow more often (Cohen & Bodner, 2019c). Thus, we hypothesised that musical training would be correlated with dispositional flow. Long hours of practice and training over many years are required for musicians to achieve technical proficiency. As grit demonstrates some predictive validity for sustained goal commitment and retention in very varied contexts, including work, schooling and marriage (Eskreis-Winkler et al., 2014), we hypothesised that grit would also be correlated with musical training.

So, the present study intends to shed more light on the associations between grit and flow in musicians by examining the possible associations between grit, growth mindset and dispositional flow in a sample of musicians. We hypothesised that 1) grit correlates with

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dispositional flow, 2) growth mindset will correlate with grit and dispositional flow, and 3) musical training correlates with both grit and flow. We also ran a hierarchical regression to examine if grit and growth mindset predicted dispositional flow over and above variables that previous studies have linked to dispositional flow in musicians. Further relevant variables (i.e. Big Five personality traits, musical training, performance anxiety, daily musical practice) were included.

Methods

Design

The study employed a correlational design in which we measured grit, growth mindset, and dispositional flow in a sample of musicians. Dispositional flow was correlated with grit and growth mindset. Exploratory correlation analysis was performed between grit, dispositional flow, and musical training. General musical sophistication, the Big Five personality traits, and performance anxiety were also measured and correlated with grit and the nine subscales of dispositional flow. These variables were then included in a hierarchical linear regression with dispositional flow as the outcome variable and grit, growth mindset and the above mentioned factors as the predictor variables.

Participants

Participants were 162 musically trained individuals (59 males, 103 females), ranging between the ages of 18 and 57 years ($M = 25.1$, $SD = 6.1$), after removing 3 cases due to missing data. Participants were mostly Malaysians ($n = 91$), followed by individuals from the United Kingdom ($n = 29$), Asian countries (e.g., Korea, Thailand, China, etc.; $n = 18$), United States of America ($n = 10$), European countries ($n = 10$), Canada ($n = 2$), and Zimbabwe ($n = 2$). There was a wide range of musical sophistication in the sample. Scores on the Goldsmiths Musical Sophistication Index (Gold-MSI) ranged from 53 to 125 ($M = 90.4$, $SD = 13.8$), out of an available score range of 18 to 126.

Materials

This study included seven standardised questionnaires: participants' sociodemographic information, grit, mindset, dispositional flow, general musical sophistication, personality, and performance anxiety. These questionnaires were presented in

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randomised order across participants, except for the sociodemographic one that was always presented first.

Grit. The 12-item Grit Scale (Duckworth et al, 2007; α = .79) was used to measure self-reported grit in participants, comprising of questions such as "I have overcome setbacks to conquer an important challenge". Responses were recorded on a 5-point Likert scale (1 = Not like me at all to 5 = Very much like me), with six out of the twelve items being reverse scored. Higher average scores (from all twelve items) indicated higher levels of grit.

Mindset. The Mindset Scale (Dweck, 2006; α = .88) includes sixteen items on a 6-point Likert scale (0 = Strongly Disagree to 6 = Strongly Agree), with eight items accounting for fixed and growth mindset respectively. These items further accounted for two separate dimensions of mindset: intelligence (first eight items) and talent (last eight items). An example of a fixed-talent mindset item was "To be honest, you can't really change how much talent you have"; and a growth- intelligence mindset would be "No matter who you are, you can significantly change your intelligence level". For this study, items for growth mindset (α = .88) and more specifically, growth-talent mindset (α = .85) were further taken into consideration. Scores were normalised.

Dispositional Flow (Flow). The Dispositional Flow Scale-2 (DFS-2) (Jackson & Eklund, 2002) is a 36-item instrument based on the nine dimensions of flow (Csikzentmihalyi, 1990; Jackson, Martin, & Eklund, 2008). It includes items indicating (a) balance between the challenge confronted and skill required, (b) a merging of action and awareness, (c) being clear of the desired goals, (d) having immediate and unambiguous feedback regarding the task undertaken, (E) total concentration, (f) a sense of control, and yet at the same time having, (g) loss of self-consciousness, (h) a distorted sense of time, and (i) an autotelic experience (intrinsically rewarding).Participants were required to respond in relation to their experience in musical practice (α = .95) and performance (α = .94), so the DFS-2 was administered twice under those two contexts. Items were phrased in statements such as "The way time passes seems to be different from normal" on a 5-point Likert scale (1 = Never to 5 = Always). Scores for overall flow were obtained by averaging both the DFS-2 scores from musical practice and performance.

Musical background. The Goldsmiths Musical Sophistication Index, version 1.0 (Gold-MSI) (Müllensiefen, Gingras, Musil, & Stewart, 2014) is comprised of 39 items (α = .90), with five subscales (active musical engagement (F1), perceptual abilities (F2), musical training (F3), singing abilities (F4), emotional engagement with music (F5)) and one overall measure (general musical sophistication). Responses were obtained on a 7-point Likert scale

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(1 = Completely disagree to 7 = Completely agree). The variable of interest, Musical Training (F3), combines years of formal musical training and practice and degree of self-assessed musicianship. Additionally, participants reported the amount of their weekly musical practice in hours. In this study, we focused on the subscale, musical training (α = .73) and the amount of daily practice (in hours) as variables.

The Big-Five Personality. The Ten-Item Personality Inventory (TIPI) (Gosling, Rentfrow, & Swann, 2003) measures the Big Five personality traits: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. Each trait was measured by two items, with one of the items being reversed scored.

Performance anxiety. The Music Performance Anxiety Inventory for Adolescents (MPAI-A) (Osborne, Kenny, & Holsomback, 2005) is a 15-item scale (α = .90) measuring anxiety in musicians, with statements such as "Just before I perform, I feel nervous". Responses were indicated on a 7 point Likert scale (0 = Not at all to 6 = All the time).

Procedure

An online survey set up on Qualtrics® was shared via social-media platform (Facebook) and the distribution of flyers across the campus. Several music schools in the UK were also invited to distribute the link of the online survey to their music students. One hundred and sixty-two participants, all adults and musically trained (formally or self-taught), completed the survey. It took an average of one hour to complete, and the participants were offered to enroll for a cash prize draw for their participation. The study protocol was approved by the local ethics committee of the university's Psychology Departmen**t.**

Statistical Analyses

Statistical analyses were conducted in IBM SPSS Statistics for Macintosh, version 22 (SPSS Inc., IBM Corp., Armonk, NY, USA). Bivariate correlations were conducted with p-values adjusted using the Benjamini-Hochberg procedure (controlling for false discovery rate of 0.05) to control for Type I error (Benjamini & Hochberg, 1995). All correlations were set at two-tailed, at an alpha level of .05.

A hierarchical linear regression was run to predict dispositional flow by studied variables. Variables that have been previously linked to dispositional flow were entered first to see the effect of grit and growth mindset after controlling for variables already known to be associated with the dispositional flow. The order of entry was determined by research

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relevance. The Big Five personality traits were entered in the first block. The musician-specific factors of musical training, music performance anxiety, and daily practice hours were entered in the second block. As the variables of interest, grit and growth mindset were entered last and in separate blocks to examine their separate contributions. Grit was entered in the third block and growth mindset was entered in the fourth block.

It was ensured that all assumptions for the hierarchical linear regression were met. Independence of observations were checked with the Durbin Watson statistic, which at 2.33 suggests that the data is not autocorrelated. Visual inspection of normal probability plots and scatterplots of residuals showed that the assumptions of normality of residuals and homoscedascity were met. To check for multicollinearity, variance inflation factor (VIF) and tolerance statistics were calculated and assessed. VIF values were all under 1.6 and tolerances > 0.63. The average VIF is 1.26, indicating that collinearity is not an issue in this model.

Results

Table 1 presents the descriptive statistics of the study's main variables. All data were screened for missing scores and outliers; 3 cases were removed for missing data. Descriptives show that the variables of interest have a relatively good range of responses. Grit and dispositional flow scores are comparable to Miksza and Tan (2015)'s sample. Perhaps due to a more varied sample of musicians, the mean dispositional flow score is higher than those found in the highly trained pianists in the sample of Marin and Bhattacharya (2013). Scores on the Musical Training dimension of the Gold-MSI show a wide range of formal musical training, given that the available score range is from 7 to 49.

Table 1

Descriptive Statistics of Grit, Growth Mindset, Musical Training (Factor 3 in the Gold-MSI), Flow, the Big Five Personality Traits, and Performance Anxiety

	Min	Max	*M*	*SD*
Grit	1.92	5.00	3.24	0.59
Growth Mindset	0.33	1.00	0.68	0.13
Musical Training	11.00	48.00	34.54	7.95
Flow	1.90	5.00	3.52	0.51
Extraversion	1.00	7.00	3.87	1.39

Agreeableness	1.00	7.00	4.84	1.09
Conscientiousness	1.00	7.00	4.76	1.30
Emotional Stability	1.00	7.00	4.27	1.36
Openness to Experience	3.00	7.00	5.23	0.91
Performance Anxiety	4.00	90.00	49.23	17.36

Note. $N = 162$; minimum (Min), maximum (Max), mean (M), standard deviation (SD).

Bivariate Correlation Tests

To test our three main hypotheses, we performed a bivariate correlation analysis between our main variables and summarised the results in Table 2. As previously found, grit was significantly correlated with flow ($r= 0.32, p <.001$). However, growth mindset did not significantly correlate with flow ($r= 0.07, p = .39$) or any other variables ($p> 0.05$). Musical training was significantly correlated with flow ($r = 0.32, p < .001$) and with grit ($r = 0.21, p = .007$).

We further examined the patterns of correlations between grit and musical training with the nine subscales of dispositional flow. Grit was significantly correlated ($p < .05$) with most flow subscales except action-awareness merging and time distortion (see Table 3). Musical training also correlated significantly with most flow subscales except three, loss of self-consciousness, time distortion and autotelic experience (see Table 3).

In this sample of musicians, dispositional flow also correlated with many of the variables previously linked to dispositional flow in musicians. Out of the Big Five personality traits, dispositional flow correlated positively with conscientiousness ($r = 0.23, p = .004$) and emotional stability ($r = 0.26, p = .001$). Grit also correlated with agreeableness ($r = 0.23, p = .003$), conscientiousness ($r = 0.52, p =.000$), and emotional stability ($r = 0.25, p =.002$). Performance anxiety correlated negatively with flow ($r = - 0.33, p < .001$) and grit ($r = -0.26, p = .001$). Grit ($r = 0.16, p = .048$) and flow ($r = 0.30, p <.001$) also significantly correlated with participants' daily hours of practice.

A further analysis showed that conscientiousness and emotional stability were both found to be significantly correlated with the following flow subscales: challenge-skill balance, unambiguous feedback, total concentration and sense of control (see Table 3). Conscientiousness was also significantly correlated with the subscale clear goals, while

emotional stability was significantly correlated with the subscale loss of self-consciousness. Lastly, performance anxiety had significant negative correlations with all flow subscales except transformation of time (see Table 3).

Table 2

Summary of Correlations for Scores on Grit, Growth Mindset, Musical Training, Flow, the Big Five Personality Traits, Performance Anxiety and Daily Practice Hours

	1	2	3	4	5	6	7	8	9	10	11
1. Grit	-										
2. Growth Mindset	0.01	-									
3. Musical Training (F3)	0.21**	0.09	-								
4. Flow	0.32***	0.07	0.32***	-							
5. Extraversion	0.14	0.04	-0.04	0	-						
6. Agreeableness	0.23**	0.04	0.16*	0.05	-0.06	-					
7. Conscientiousness	0.52***	-0.03	0.18*	0.23**	0.11	0.14	-				
8. Emotional Stability	0.25**	0.14	0.19*	0.26**	0.05	0.36***	0.20*	-			
9. Openness to Experience	0.04	-0.06	0.14	0.03	-0.01	0.14	0.03	0.11	-		
10. Performance Anxiety	- 0.26***	-0.06	- 0.27***	- 0.33***	-0.19	0.01	-0.17	- 0.30***	-0.06	-	
11. Daily Practice Hours *(N = 151)*	0.16*	0.09	0.35**	0.30**	0.11	0.03	0.08	0.00	0.12	-0.13	-

Note. Unless otherwise stated, $N = 162$; *p <.05, **p<. 01, ***p< .001 after controlling for a false discovery rate of .05.

Table 3

Correlations for flow subscales with grit, musical training, conscientiousness, emotional stability and performance anxiety

	Flow	Challenge-skill Balance	Action-awareness Merging	Clear Goals	Unambiguous Feedback	Total Concentration	Sense of Control	Loss of Self-Consciousness	Transformation of Time	Autotelic Experience
1. Musical Training	.315**	.385**	.299**	.330**	.364**	.243**	.242**	.013	.107	.119
2. Grit	.316**	.258**	.074	.437**	.209**	.405**	.317**	.161*	.008	.175*
3. Conscientiousness	.228**	.213**	.122	.356**	.157*	.239**	.249**	.073	-.011	.098
4. Emotional Stability	.261**	.304**	.093	.152	.191*	.282**	.360**	.227**	-.018	.096
5. Performance Anxiety	-.325**	-.257**	-.216**	-.186*	-.209**	-.335**	-.405**	-.323**	.070	-.218**

N = 162; *p* <.05, **p<. 01, ***p< .001 after controlling for a false discovery rate of .05.

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Table 4 |
Hierarchical Regression Analysis of Predictors of Flow Proneness in Musicians (N = 151)

Predictor variables		Standardised regression coefficients			
		Regression 1	Regression 2	Regression 3	Regression 4
Big Five personality traits	Openness to Experience	0.03	-0.02	-0.02	-0.01
	Conscientiousness	0.22**	0.16*	0.12	0.13
	Extraversion	-0.03	-0.10	-0.11	-0.11
	Agreeableness	-0.07	-0.05	-0.07	-0.07
	Emotional Stability	0.23**	0.13	0.12	0.11
Musical Factors	Musical Training (Gold-MSI F3)		0.13	0.13	0.12
	Music Performance Anxiety		-0.27***	-0.25**	-0.25**
	Amount of Daily Practice		0.22**	0.21**	0.21**
Non-cognitive factors	Grit			0.10	0.10
	Growth Mindset				0.07
R^2		0.12**	0.28***	0.29***	0.29***
R^2 Change			0.17***	0.01	0.00

$n = 152$; *$p < .05$, **$p < .01$, ***$p < .001$

Hierarchical Linear Regression

We ran a hierarchical linear regression to test if grit added any predictive power over and above that of previously studied predictors of dispositional flow in musicians. Predictors that have been studied previously were entered first into the model, followed by the new predictors. First, personality traits were entered in block 1. Music-related factors, musical training, performance anxiety, and amount of daily musical practice (in hours) were included in block 2. Grit was then entered in block 3, and finally, growth mindset entered in block 4. The results are presented in Table 4. In our sample, only 2 of the Big Five dimensions, Conscientiousness and Emotional Stability, correlated with flow proneness in musicians and together, they explained 12% of the variance in dispositional flow. Musical factors such as musical training, the lack of music performance anxiety and amount of daily practice predicted an additional 17%. However, of musical factors, only music performance anxiety and amount of daily practice were significant predictors of dispositional flow. After adding them to the model, the personality trait of Emotional Stability was no longer significant, possibly reflecting that it may share some overlap with music performance anxiety in predicting dispositional flow. The variance explained by conscientiousness was also reduced after daily practice hours are added. When grit was added, it contributed to 1% of the explained variance, and possibly due to some overlap with conscientiousness, further reduced the variance explained by conscientiousness so that conscientiousness was no longer a significant predictor of dispositional flow. Growth mindset, however, did not add to the explanatory power of the model. When all factors were included in the model, the only factors that significantly predicted dispositional flow were performance anxiety and hours of practice (see Table 4). This suggests that though grit may have correlated with flow, after controlling for other factors previously linked to dispositional flow, the predictive contribution of grit to dispositional flow was not significant.

Discussion

      In this study, we investigated the potential links between grit, growth mindset and dispositional flow in musicians, particularly after accounting for the effect of factors previously found to correlate with dispositional flow in musicians, namely, musical training, amount of daily musical practice, the Big Five personality traits, and performance anxiety. Results revealed three main findings: (i) grit significantly correlated with dispositional flow, but it added no additional explanatory power when previous predictors were taken into account, (ii) growth mindset did not correlate with either grit or flow and (iii) musical training correlated with both grit and flow. In the remainder of this Discussion, we discuss each of these principal findings and some additional exploratory findings, followed by some remarks on potential limitations of the current study.

      Grit was found to correlate with dispositional flow in this sample of musicians, replicating the earlier finding by Miksza and Tan (2015). At $r = .32$, the correlation between grit and flow is smaller than the correlation found in Miksza and Tan (2015) ($r = .53$). This could be due to the fact that the present sample drew from musicians from a larger range of musical backgrounds than the music college students of the previous sample. However, grit did not predict dispositional flow over and above other factors that have previously been linked to dispositional flow in musicians. These factors include personality traits and musician-specific factors like practice house and music performance anxiety. The personality factors of Conscientiousness and Emotional Stability have been previously found to be correlated with flow proneness in daily living (Ross & Keiser, 2014; Ullén et al., 2012; Ullén, Harmat, Theorell, & Madison, 2016). In this sample, the personality factors of Conscientiousness and Emotional Stability were also found to be correlated with dispositional flow in musicians. Specific to musicians, hours of practice have frequently been found to correlate with dispositional flow in musicians (Butkovic et al., 2015; Heller et al., 2015; Marin & Bhattacharya, 2013; Miksza & Tan, 2015) and music performance anxiety is negatively correlated with dispositional flow (Cohen & Bodner, 2019a; Fullagar et al., 2013). It is noteworthy that these findings, previously found in Western samples, have been replicated in our predominantly Asian sample. When a hierarchical linear regression was run and grit was entered in the model after these factors, grit did not add a significant amount of predictive power to the model for dispositional flow. In the full model, music performance anxiety and daily practice hours are the only significant predictors for dispositional flow in

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this sample of musicians, suggesting that the strongest predictors for musicians' flow experience are how you feel while playing music and how often you engage in it.

Music performance anxiety was the most predictive factor of dispositional flow in this sample of musicians. Performance anxiety was also negatively correlated with grit, musical training, flow, and emotional stability. This indicates that participants who experienced more anxiety when performing music also had lower scores on grit, received less musical training, experienced less dispositional flow and were less emotionally stable. The negative correlations between performance anxiety and flow are consistent with findings from Fullagar et al. (2013) who suggest that flow and performance anxiety are opposing and contradicting experiences (Fullagar et al., 2013).When a musician is highly anxious before a performance, flow experience is unlikely. Of note, flow has been postulated as an effective tool to reduce performance anxiety (Cohen & Bodner, 2019b; Lamont, 2012; Wrigley & Emmerson, 2013).

The full model only explained 29% of the variance in dispositional flow. This suggests that there are other factors relating to dispositional flow in musicians. In fact, the inclination to practice, flow proneness and musical achievement may be the result of a pleiotropic genetic influence, much as dispositional flow in general life is also has a moderate heritability (Butkovic et al., 2015; Mosing, Magnusson, et al., 2012). In addition, the main external condition for flow is an optimal match between an individual's skill and the challenge of a situation (Csikszentmihalyi, 1975). Certain traits, such as an internal locus of control and high need for achievement, make one more sensitive to this external condition and could explain further variance in dispositional flow (Engeser & Rheinberg, 2008; Keller & Blomann, 2008; Mosing, Pedersen, et al., 2012). Trait intrinsic motivation has previously found to be correlated to dispositional flow in daily life and it is likely that intrinsic motivation for musical activities also play a role in music-related dispositional flow (Ullén et al., 2016). Trait emotional intelligence has been previously linked to dispositional flow in musicians (Marin & Bhattacharya, 2013) and individual differences in the ability to effectively identify and regulate one's emotions may also explain variance in dispositional flow. These are factors that can be included in future hierarchical regressions to explain variance in dispositional flow in musicians.

We find that growth mindset was not correlated with either grit nor dispositional flow in musicians. The lack of a relationship between grit and growth mindset seems at odds because it is often claimed that "growth mindset and grit go together" (Duckworth, 2016,p. 181, especially based on data from college students). However, our participants, who are musicians, might not believe that a growth mindset can be beneficial for their musical training. In theory, those with a growth mindset would redouble their efforts when faced with a challenge (Dweck, 2010; Dweck & Leggett, 1988) but this might not represent the best response in every circumstance as it might be a waste of energy and resources (Burnette et al., 2013). Indeed, in some circumstances, having a fixed mindset might enable one to achieve their desired end goal more quickly and effectively (Burnette et al., 2013). Further, the growth mindset is culture-dependent; for example, in certain cultures, creativity is considered as more fixed and less changeable (Tang, Werner, & Karwowski, 2016). Our sample is predominantly from Asia where, compared to learners from Western countries, natural talent is often perceived to be more influential than hard work (Asbury, Klassen, Bowyer-Crane, Kyriacou, & Nash, 2016; Mercer & Ryan, 2009). Future studies might explore these differences, including both context- (i.e. artistic and non-artistic achievements), and culture- (i.e. East Asians vs Westerners) specific effects of the growth mindset. Mindset may also play a smaller role than originally thought. A recent study found that the effect of mindset on goals orientation, persistence and resilience in face of failure were significantly weaker than the average effect size found in social-psychological research (Burgoyne, Hambrick, & Macnamara, 2020). Its effects may be even smaller for adults as compared to children, as found by a meta-analysis (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018).

We found significant correlations between musical training and both grit and flow. More musically trained people did experience more flow. Challenge-skill balance correlated with musical training, providing further support for Cohen's (2019) conjecture that increased training and practice provide the skills for musicians to experience more challenge-skill balance. Previous studies have not found conclusive evidence that professional musicians experience more flow than amateurs, or that the quality of music students' flow was significantly influenced by advancement in their studies or that years of training influenced dispositional flow (Marin & Bhattacharya, 2013; Sinnamon, Moran, & O'Connell, 2012; Wrigley & Emmerson, 2013). The more multidimensional and continuous measure of musical training used in this study, which takes into account years of formal training and practice and self-assessed musicianship, may be a more sensitive measure to test the

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hypothesis that training influences dispositional flow. As for grit, it is plausible that participants who were more committed to their long-term goals were more likely to acquire musical skills and training.

The influence of grit and flow on musical training has interesting implications for long-term musical engagement. Both intrinsic and extrinsic motivation play a role in musicians' engagement with music at any point in their development. Music is intrinsically enjoyable but early on, children may require external motivators. Parents, teachers and peers are instrumental in shaping children's self-concepts and habits and so may be considered external motivators (Sichivitsa, 2007). Professional musicians report the highest intrinsic motivation, yet are also more likely to report that their musical activities like rehearsals and performances are driven by extrinsic motivators like pay (Juniu, Tedrick, & Boyd, 1996). However, as intrinsic motivation reported to be highest in people who have engaged in it for the longest time and to the greatest depth (Appelgren, Osika, Theorell, Madison, & Bojner Horwitz, 2019), it seems intrinsic motivation is key for long-term engagement in music. Hence, the experience of flow during music, as a state of high intrinsic motivation, may serve as an intrinsic motivator for continued musical engagement. People who experience the most flow also practice the most hours (Heller et al., 2015; Marin & Bhattacharya, 2013). As grit positively correlates with intrinsic motivation and negatively correlates with extrinsic motivation, it is suggested that one is more likely to make an effort to persevere and maintain interest in an activity when one is intrinsically motivated (Zhao et al., 2018). Evidence suggests that a desire to experience flow, or an orientation towards engagement, promotes grit by encouraging sustained effort over time (Von Culin, Tsukayama, & Duckworth, 2014). In fact, Kirby et al. (2014) suggest that long-term challenge is the mechanism of grit (Kirby et al., 2014). It is through engaging with challenges over a long time that the disposition of grit can be fully expressed. Hence, grit and flow may have mutually reinforcing effects that promote long-term musical engagement and achievement.

Several limitations of this study must be acknowledged. First, we cannot assume the generalizability of our findings. The majority of participants are Malaysians so that this study may be specific to Malaysian musicians and the psychological underpinnings of their musical experiences. Future studies should include more musicians from other parts of the world. Second, while some previous studies looked at dispositional flow in professional musicians or students at music colleges, the present sample drew from musicians from more varied

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backgrounds and participants showed a large range of musical sophistication. Third, the data presented are correlational rather than experimental. Thus, the causal role of any specific personality trait cannot be inferred. To increase external validity, future research may consider introducing observational tasks to test the growth mindset of participants as past research has done via intervention programs in a classroom setting (Blackwell, Trzesniewski, & Dweck, 2007; Devers, 2011; Yeager & Dweck, 2012). Finally, it should be noted that even though the hierarchical linear regression uses grit to predict flow, the correlational nature of the study means that it is not possible to distinguish the direction of causation. Longitudinal research – principally with repeated measures – will be needed to reveal the mechanisms by which grit in musical practice would lead to flow experience, and eventually to musical achievements.

In conclusion, this study offered a closer look at the claims of the effects of non-cognitive factors like grit and growth mindset in predicting flow experience in musicians. Grit, but not growth mindset, was significantly related to musicians' flow experience and demonstrated added predictive power after controlling for other personality traits, but this effect disappeared after controlling for daily practice hours. However, flow and grit were highest in those with the most musical training, offering a tantalising hint as to the effects of non-cognitive factors and flow experience in motivating musicians to undertake long years of training and practice. As research in the field of implicit theories and specifically on the growth mindset intervention continues to progress (Adams, 2019; Yeager et al., 2019), we will move closer to understanding the relationship between flow and non-cognitive traits such as grit and growth mindset, which could help musicians better position themselves to enter flow and reduce the detrimental effects of performance anxiety.

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Table 1

Descriptive Statistics of Grit, Growth Mindset, Musical Training (Factor 3 in the Gold-MSI),

Flow, the Big Five Personality Traits, and Performance Anxiety

	Min	Max	*M*	*SD*
Grit	1.92	5.00	3.24	0.59
Growth Mindset	0.33	1.00	0.68	0.13
Musical Training	11.00	48.00	34.54	7.95
Flow	1.90	5.00	3.52	0.51
Extraversion	1.00	7.00	3.87	1.39
Agreeableness	1.00	7.00	4.84	1.09
Conscientiousness	1.00	7.00	4.76	1.30
Emotional Stability	1.00	7.00	4.27	1.36
Openness to Experience	3.00	7.00	5.23	0.91
Performance Anxiety	4.00	90.00	49.23	17.36

Note. N = 162; minimum (Min), maximum (Max), mean (*M*), standard deviation (*SD*).

Table 2

Summary of Correlations for Scores on Grit, Growth Mindset, Musical Training, Flow, the Big Five Personality Traits, Performance Anxiety and Daily Practice Hours

	1	2	3	4	5	6	7	8	9	10	11
1. Grit	-										
2. Growth Mindset	0.01	-									
3. Musical Training (F3)	0.21**	0.09	-								
4. Flow	0.32***	0.07	0.32***	-							
5. Extraversion	0.14	0.04	-0.04	0	-						
6. Agreeableness	0.23**	0.04	0.16*	0.05	-0.06	-					
7. Conscientiousness	0.52***	-0.03	0.18*	0.23**	0.11	0.14	-				
8. Emotional Stability	0.25**	0.14	0.19*	0.26**	0.05	0.36***	0.20*	-			
9. Openness to Experience	0.04	-0.06	0.14	0.03	-0.01	0.14	0.03	0.11	-		
10. Performance Anxiety	- 0.26***	-0.06	- 0.27***	- 0.33***	-0.19	0.01	-0.17	- 0.30***	-0.06	-	
11. Daily Practice Hours (*N* = 151)	0.16*	0.09	0.35**	0.30**	0.11	0.03	0.08	0.00	0.12	-0.13	-

Note. Unless otherwise stated, $N = 162$; *p <.05, **p<. 01, ***p< .001 after controlling for a false discovery rate of .05.

Table 3

Correlations for flow subscales with grit, musical training, conscientiousness, emotional stability and performance anxiety

	Flow	Challenge-skill Balance	Action-awareness Merging	Clear Goals	Unambiguous Feedback	Total Concentration	Sense of Control	Loss of Self-Consciousness	Transformation of Time	Autotelic Experience
1. Musical Training	.315**	.385**	.299**	.330**	.364**	.243**	.242**	.013	.107	.119
2. Grit	.316**	.258**	.074	.437**	.209**	.405**	.317**	.161*	.008	.175*
3. Conscientiousness	.228**	.213**	.122	.356**	.157*	.239**	.249**	.073	-.011	.098
4. Emotional Stability	.261**	.304**	.093	.152	.191*	.282**	.360**	.227**	-.018	.096
5. Performance Anxiety	-.325**	-.257**	-.216**	-.186*	-.209**	-.335**	-.405**	-.323**	.070	-.218**

$N = 162$; *p <.05, **p<. 01, ***p< .001 after controlling for a false discovery rate of .05.

Table 4 |

Hierarchical Regression Analysis of Predictors of Dispositional Flow in Musicians (N = 151)

Predictor variables		Standardised regression coefficients			
		Regression 1	Regression 2	Regression 3	Regression 4
Big Five personality traits	Openness to Experience	0.03	-0.02	-0.02	-0.01
	Conscientiousness	0.22**	0.16*	0.12	0.13
	Extraversion	-0.03	-0.10	-0.11	-0.11
	Agreeableness	-0.07	-0.05	-0.07	-0.07
	Emotional Stability	0.23**	0.13	0.12	0.11
Musical Factors	Musical Training (Gold-MSI F3)		0.13	0.13	0.12
	Music Performance Anxiety		-0.27***	-0.25**	-0.25**
	Amount of Daily Practice		0.22**	0.21**	0.21**
Non-cognitive factors	Grit			0.10	0.10
	Growth Mindset				0.07
R^2		0.12**	0.28***	0.29***	0.29***
R^2 Change			0.17***	0.01	0.00

n = 152; **p* <.05, ***p*<. 01, ****p*< .001