Original Research Article

National Association for Music Education

Journal of Research in Music Education
2020, Vol. 68(2) 156–174
© National Association for Music Education 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0022429420908312
jrme.sagepub.com
SAGE

Learning Music Composers' Styles: To Block or to Interleave?

Sarah Shi Hui Wong[1], Amanda Chern Min Low[1], Sean H. K. Kang[2], and Stephen Wee Hun Lim[1]

Abstract

The ability to recognize and distinguish among varying musical styles is essential to developing aural skills and musicianship. Yet, this task can be difficult for music learners, particularly nonexperts. To address this challenge and guide music education practice, this study drew on cognitive psychological principles to investigate the effect of interleaved presentation of music pieces by various classical music composers on learning to identify these composers' styles. Participants with 4 or fewer years of musical experience were presented with music pieces from six composers in an interleaved manner (alternating between listening to different composers' works) and music pieces from another six composers in a blocked fashion (listening to works by one composer at a time before moving on to the next). A later test in which participants had to classify novel pieces by the same 12 composers revealed the superiority of interleaved over blocked presentation, although most participants misjudged blocking to be more effective than interleaving. This finding provides evidence for the utility of interleaving in teaching music composers' styles and extends the literature on the interleaving effect in category induction to the auditory domain. Practical implications and future directions for the use of interleaving in music education are discussed.

Keywords

musical style discrimination, musical listening, categorization, inductive learning, interleaving

[1]National University of Singapore, Singapore
[2]Dartmouth College, Hanover, NH, USA

Corresponding Author:
Sarah Shi Hui Wong or Stephen Wee Hun Lim, Department of Psychology, Faculty of Arts & Social Sciences, National University of Singapore, Block AS4, 9 Arts Link, Singapore, Singapore 117570, Singapore.
Email: psywshs@nus.edu.sg or psylimwh@nus.edu.sg

Holistic musical learning encompasses the development of many interconnected skills. Besides technical skills that are essential in music performance, musical perception abilities and an appreciation for music are also crucial to musicianship (Hallam, 2010; Seashore, 1915). In particular, listening skills are integral to musical perception and have even been considered "prerequisite to all other musical pursuits" (Madsen & Geringer, 2000–2001, p. 103). Indeed, listening skills are valued across various music curricula around the world. For example, in the British National Curriculum for music, the ability to "listen with increasing discrimination to a wide range of music from great composers and musicians" is an attainment target at Key Stage 3 (Department for Education, England, 2013). Similarly, the ability to "identify the context of music from a variety of genres, cultures, and historical periods" is part of the American Core Music Standards in Grades 6 through 8 (National Coalition for Core Arts Standards, 2014). Likewise, in Singapore, where this research was conducted, appreciating music in local and global cultures is a key learning objective in the General Music Programme that is offered to students during their primary to lower secondary school years (Ministry of Education, Singapore, 2015).

Concurrently, musical listening has featured prominently in assessments of musicianship. For instance, the graded music examinations by the UK's Associated Board of the Royal Schools of Music (ABRSM, 2017), which has been highly influential in shaping music education in Singapore (Stead & Lum, 2014), include aural tests that evaluate listening skills and musical perception. Notably, to assess proficiency in aural awareness, one of these tests involves having students listen to a musical piece before describing its characteristic features and identifying the style and period of Western classical music (baroque, classical, romantic, or 20th century) during which the piece was most likely composed.

The concept of "musical style" has often been discussed in relation to regularities and systems of structural musical traits that may be present in both musical composition and listening (Baroni, 2006). For instance, Meyer (1989) defined style as "a replication of patterning, whether in human behavior or in the artifacts produced by human behavior, that results from a series of choices made within some set of constraints" (p. 3). Hence, musical styles are necessarily situated within the constraints of the historical, cultural, and geographical contexts in which they occur, which influence both objective musical qualities and listeners' subjective perceptions (Baroni, 2009). Besides these broader contexts, however, the musical styles of individual composers are simultaneously embedded within the more specific context of their own compositional output in their career. As such, the present study focused on investigating techniques that can be practically applied to enhance listeners' learning of given Western classical music composers' styles when presented with multiple works by each composer.

The perception of musical styles may be conceived as a cognitive process of classification in which listeners must extract and compare meaningful musical features to differentiate various styles (Baroni, 2006; Storino, Dalmonte, & Baroni, 2007). Such identification of stylistic differences appears to be shaped by one's familiarity with the styles in question, whereby listeners are more likely to make finer distinctions among musical styles that they are familiar with (Hargreaves & North, 1999). In particular, musical training has been associated with differences in perceptions of musical styles, especially where concept formation—a problem in musical learning (Carlsen, 1969)—is concerned. For instance, whereas the dimension of historical period has been found to be most salient for experts when judging the similarity of Western classical music excerpts, secondary musical parameters such as activity, character, and evaluations of pleasingness are most salient for novice music listeners, whose judgments do not indicate any dimension related to historical period (Gromko, 1993). Furthermore, novices have been observed to rely on extrathematic parameters such as dynamics and pitch when categorizing thematic transformations of Liszt's "Sonata in B Minor", such that they perceived higher-order thematic structures only after repeated listening (Pollard-Gott, 1983).

Taken together, the emerging account from these studies is that while listeners who possess limited musical expertise, experience, and/or familiarity with Western classical music may be generally sensitive to such musical styles, they may face challenges making finer explicit distinctions based on primary musical parameters related to stylistic norms. Accordingly, differentiating musical pieces to specifically identify the exact composer of a piece may be difficult for nonexperts. In view of this pressing challenge in musical learning, how can educators facilitate their students' learning of various composers' styles? Many studies have shown that simple changes to one's learning technique can significantly improve the acquisition and retention of knowledge (for a review, see Dunlosky et al., 2013). As such, cognitive psychological principles may offer great utility in informing educational practice aimed at guiding music students to distinguish among composers' styles. In particular, one promising approach may be the use of interleaving when listening to varied musical pieces during learning.

The Interleaving Effect

In the cognitive and educational psychology literature, the learning of various "styles" or categories has been investigated in research on *concept learning* (Klausmeier & Harris, 1966; Spalding & Ross, 2000), which Dominowski (1965) defined as "the acquisition of the same response to a number of stimuli having certain characteristics in common" (p. 271). Across various theories of how categories are learned (Kruschke, 1992; Rosch & Mervis, 1975; for a review, see Kruschke, 2006), repeated exposure to the to-be-learned information is needed when acquiring new concepts, and the extent that instances of the same concept occur contiguously affects concept formation and learning (Carpenter, 2014; Dominowski, 1965; Underwood, 1952).

Intuitively, practicing concepts one at a time may seem to be most beneficial for learning. When given a choice, learners overwhelmingly elect to schedule their practice in a blocked fashion (Tauber et al., 2013) by studying exemplars of the same category consecutively before moving on to another category (e.g., AAABBBCCC). Indeed, repetition is a time-honored practice technique that is frequently adopted by young music learners and expert musicians, who often report playing target music passages over and over again during their practice (Austin & Berg, 2006; Barry, 1992, 2007; Leon-Guerrero, 2008; Maynard, 2006; Rohwer & Polk, 2006). However, numerous studies have instead found that interleaving, in which instances from the different concepts to be learned are intermixed (e.g., ABCACBCAB), enhances performance on a subsequent test. This finding has been termed the *interleaving effect* and has been robustly tested across diverse domains such as motor skills (Shea & Morgan, 1979) and mathematics learning (Rohrer, Dedrick, & Burgess, 2014; Taylor & Rohrer, 2010). More recently, interleaving has also been established to produce superior musical performance, whereby advanced clarinet performances of technical exercises and concerto expositions that had been practiced in an interleaved schedule were subsequently rated better by professional clarinetists than those that had been practiced in a blocked schedule (Carter & Grahn, 2016). In fact, blocked practice schedules have been associated with poorer long-term retention, whereby musical performance is slower on a delayed test than at initial practice (Stambaugh, 2011). As these compelling research findings illustrate, commonly adopted methods of instruction and learning in which concepts are blocked do not always optimize learning, counterintuitive as this may be. Rather, interleaving may be a more effective strategy in some learning contexts.

Of particular interest to this study is that interleaving has also been found to improve category induction—the learning of a category's defining features through exposure to a limited number of its members. In a landmark study by Kornell and Bjork (2008) that was later replicated with older adult participants (Kornell et al., 2010), undergraduates were asked to learn the painting styles of 12 artists by observing six paintings from each artist, all depicting either a landscape or skyscape. The paintings from six of the artists were blocked (i.e., all paintings from a single artist were presented consecutively), while those from the other six artists were interleaved (i.e., intermixed with paintings from other artists). After the learning phase, four new paintings from each of the 12 artists were presented, and participants were asked to indicate who they thought had painted them. Participants also specified whether they thought blocking or interleaving had helped them more. Kornell and Bjork (2008) found that participants were significantly better at categorizing new paintings from artists whose works had earlier been interleaved than blocked, providing support for the notion that interleaving facilitates category induction. Yet, the overwhelming majority of participants thought that blocking was more effective than interleaving regardless of their actual performance, suggesting a lack of metacognitive awareness about the learning strategy that had actually helped them more.

To explicate the interleaving advantage for category induction, two theoretical accounts may be considered. One possibility is that the benefits of interleaving are due to the *spacing effect*, in which recall is enhanced for information that is repeated spaced apart rather than back to back (e.g., Birnbaum et al., 2013; Cepeda et al., 2006; Dempster, 1996; Seabrook et al., 2005; Vlach et al., 2008). Presumably, spacing aids learning because learners' effortful retrieval of information from memory each time it reoccurs after a time interval promotes deeper processing (Dunlosky et al., 2013; Pyc & Rawson, 2009), such that increasing the amount of spacing between exemplars improves category learning (Birnbaum et al., 2013). Yet, although interleaving entails that presentations of a concept are spaced, research by Kang and Pashler (2012) revealed that the benefits of interleaving are not due to spacing alone. Rather, another explanation of the interleaving effect is the *discriminative-contrast hypothesis*, which postulates that juxtaposing exemplars from different categories through interleaving draws learners' attention to the key differences across categories (particularly those that are difficult to tell apart) and enables better discrimination among them (Birnbaum et al., 2013; Goldstone & Steyvers, 2001; Kang & Pashler, 2012). Accordingly, interleaving may facilitate the differentiation and classification of novel exemplars of various composers' styles, as opposed to blocking, which promotes the detection of similarities among exemplars within a category or musical style.

Interleaving Versus Blocking in Learning Music Composers' Styles

The ability to identify the compositional style of a piece of music has often been considered a sophisticated hallmark of musical expertise because nonexpert listeners are typically not fully proficient at explicitly recognizing and labeling musical styles (Dalla Bella & Peretz, 2005). While listeners without any formal musical training are reportedly capable of broad musical stylistic discrimination (e.g., judging the stylistic similarity of a piece of baroque vs. classical music) with passive long-term exposure to music (Dalla Bella & Peretz, 2005), it is pedagogically valuable to consider how such learning processes may be facilitated and whether nonexperts can be taught to make finer grained distinctions with explicit labeling (e.g., specifically identifying the exact composer of a music piece). To this end, the present study investigated the effects of interleaved versus blocked presentation of various composers' musical works on nonexperts' subsequent ability to recognize and identify these composers' styles. Excerpts from preexisting classical music compositions (preludes) were used in our study to approximate the task parameters in real-world aural tests (e.g., ABRSM, 2017). We hypothesized that interleaving music pieces across different composers rather than blocking music pieces by composers would lead to superior category learning, whereby participants would be better at categorizing novel works by these same composers in a later test.

In addition, we noted that prior interleaving studies investigating category induction have focused almost exclusively on visual stimuli such as paintings (Kornell & Bjork, 2008) and pictures of birds and butterflies (Birnbaum et al., 2013), neglecting auditory category learning. Given this gap in extant research, it remains unresolved if the benefits of interleaving in inductive learning extend to auditory stimuli, particularly given that discriminating among multiple categories involves drawing on one's memory of these categories' defining features and auditory memory has been found to be "markedly inferior" compared to visual memory (Cohen et al., 2009, p. 6009). As such, a second goal of the present study was to ascertain the contribution of interleaving in learning musical categories to extend the interleaving effect to the auditory modality.

At the same time, we explored participants' metacognitive awareness about the effectiveness of interleaving relative to blocking. Poor metacognitive awareness of various strategies' utility may lead to the adoption of suboptimal learning and instruction techniques. For instance, learners often misperceive blocked presentations as more effective than interleaved presentations even when they had actually benefited more from interleaving (e.g., Kornell & Bjork, 2008; Zulkiply et al., 2012). Moreover, these metacognitive illusions about the effectiveness of blocking tend to be particularly entrenched and resistant to dislodging (Yan et al., 2016). As such, we predicted that learners in the present study would misjudge blocking to be more useful than interleaving even if their learning of musical styles had in fact been better facilitated by interleaving.

Method

Participants

Seventy-one students (41 were female), ages between 18 and 29 years ($M = 21.70$, $SD = 1.99$), from the National University of Singapore (NUS) participated in this study. All participants had 4 or fewer years of self-reported general musical experience (e.g., years spent learning a musical instrument, working in a music-related capacity, etc., as in Lim & Goh, 2012, 2013). Participants received either course credits or a reimbursement of SGD$10 for an hour of involvement. This research was conducted with the appropriate ethics review board approval by the NUS, and participants provided their written informed consent.

Materials

Musical stimuli. Following Kornell and Bjork's (2008) experimental paradigm, we identified 12 composers, with 3 composers from each of the four major historical periods in Western classical music (baroque, classical, romantic, and 20th century). This selection procedure was intended purely to ensure that any effects observed would be generalizable to composers across various eras rather than to elucidate any differences arising from historical periods per se. The 12 composers were: *baroque*: Bach, Buxtehude, Fischer; *classical*: Clementi, Hummel, Kalkbrenner; *romantic*: Chopin, Rachmaninoff, Scriabin; and *20th century*: Debussy, Kabalevsky, Kapustin. Ten music pieces by each of these 12 composers were then selected for a total of 120 pieces. Because there are various musical forms (e.g., preludes, waltzes, sonatas, etc.), each with their own defining features, this parameter was kept constant to ensure that participants could not make classifications based on associating composers with certain musical forms (e.g., Bach with preludes vs. Clementi with sonatas). Specifically, only preludes—short pieces that may be a standalone work or serve as an introduction to a longer work—were used in this study (see supplemental material in the online version of the article). All selected preludes had been written for piano, keyboard, harpsichord, or organ and had a regular meter (i.e., a time signature of 2/4, 4/4, etc.). The opening of each piece was entered into a music notation software (Sibelius 7), and a piano sound recording was generated for each piece via the software's playback function. These recordings were then edited to be exactly 5 seconds long each (audio samples are available in the supplemental material in the online version of the article). Six pieces from each of the 12 composers were randomly designated as the study stimuli and were presented during the study phase (i.e., 72 study items), while the remaining four pieces were used as test items during the test phase (i.e., 48 test items).

Goldsmiths Musical Sophistication Index. Musical sophistication was assessed as a potential predictor of participants' inductive learning performance using the Goldsmiths Musical Sophistication Index (Gold-MSI), a 38-item battery that assesses musical sophistication in the general population through multiple self-reported musical skills and behaviors (Müllensiefen et al., 2014). Specifically, the Gold-MSI includes five subscales: active musical engagement (9 items; α = .77, e.g., "I spend a lot of my free time doing music related activities"), perceptual abilities (9 items; α = .87, e.g., "I can tell when people sing or play out of tune"), musical training (7 items; α = .89, e.g., "I can play __ musical instruments"), emotional responses to music (6 items; α = .54, e.g., "Music can evoke my memories of past people and places"), and singing abilities (7 items; α = .76, e.g., "After hearing a new song two or three times, I can usually sing it by myself"). All ratings were performed on a 7-point scale. Following Müllensiefen et al. (2014), a measure of general musical sophistication was also derived from participants' scores on 18 items of the Gold-MSI (α = .89), with higher scores indicating greater musical sophistication. All Cronbach's alphas reported here were computed from our study's data.

Musical Ear Test. To check for the potential influence of participants' musical competence on their inductive learning performance, we employed the Music Ear Test (MET) as a measure of musical expertise (Wallentin et al., 2010). The MET (α = .79) consists of a melody (α = .76) and a rhythm (α = .57) subtest, with each subtest including 52 pairs of musical phrases that participants have to judge either as identical or not. Thus, participants must hold the first musical phrase in working memory to compare it to the second phrase when making same-different judgments. Performance on the MET has been found to correlate with scores on working memory tasks such as the forward digit span test (Hansen et al., 2012; Wallentin et al., 2010), in which participants are presented with a sequence of numerical digits and are asked to recall this sequence, with sequence length increased in each trial (Conway et al., 2005).

Design

The present study utilized a fully within-subjects design. The independent variable of interest was the sequencing of the music pieces: blocked (all music pieces in a block were by the same composer) versus interleaved (each music piece in a block was by a different composer). A second independent variable, test block, was included for control purposes (i.e., to ensure that effects, if any, persisted across the four blocks in which the test trials were presented). Accordingly, all participants went through both the blocked and interleaved conditions as well as all four test blocks. The dependent variable was the proportion of novel music pieces whose composers were correctly identified by participants in a test.

Procedure

The experiment comprised of a study phase and test phase, both of which were presented to participants using E-Prime 2.0 (Psychology Software Tools, Pittsburgh, PA), a software package for computerized stimulus presentation. Participants first completed the Gold-MSI before they were given instructions about the nature of both phases. They then began the study phase, during which they listened to excerpts of 72 music pieces, 6 from each of the 12 composers. Each excerpt was 5 seconds long and was presented to participants via headphones while the respective composer's name was displayed onscreen. The presentation duration of 5 seconds per excerpt was specifically intended to ensure that the task would be challenging for nonexpert listeners and provide a rigorous test of the interleaving effect in our study.

The stimuli were presented in 12 blocks of six clips each, and the overall block order was BIIBBIIBBIIB, where "B" and "I" refer to blocked and interleaved, respectively. Within each of the 12 blocks, the order of stimuli presentation was randomized for each participant. Six of the composers' works were presented in a blocked format, while the remaining six composers' works were presented in an interleaved format. Participants were randomly assigned to receive one of two counterbalanced versions of the program, whereby the six composers whose pieces had been presented in blocked format in one version (Buxtehude, Chopin, Clementi, Hummel, Kabalevsky, and Rachmaninoff) were presented as interleaved in the other and vice versa for the remaining six composers (Bach, Debussy, Fischer, Kalkbrenner, Kapustin, and Scriabin). For example, whereas half of the participants listened to Bach's preludes in blocked format (i.e., six of Bach's preludes were presented consecutively within the same "B" block), the remaining half of the participants listened to these same preludes in interleaved format (i.e., one of six preludes by Bach was presented in each "I" block). This was to ensure that any observed effects would be due to the sequencing of the music pieces and not because certain composers' musical styles could be more readily identified.

At the end of the study phase, a 15-second distractor task was administered in which participants counted down by threes from 547. Upon completion of the distractor task, the test phase began. The 48 test items were divided into four blocks of 12 trials, with each of the 12 test items from a different composer. The order of presentation was randomized for each participant. In each test trial, a new 5-second music piece by 1 of the 12 composers was presented. Participants had to indicate who they thought had composed it by typing a number from 1 to 12, with each number corresponding to a composer's name as presented onscreen. After providing a response, participants were given feedback to inform them if they had answered correctly or incorrectly. Then, participants were asked to indicate the degree to which they liked the music piece on a 7-point Likert-type scale (1 = *not at all*, 7 = *very much*).

After the test phase, participants were informed of the meanings of *blocked* and *interleaved* and were asked to indicate which presentation mode they thought had helped them

Table 1. Mean Interleaved and Blocked Performance Scores by Test Block.

	Interleaved Performance		Blocked Performance	
Test Block	*M*	*SD*	*M*	*SD*
Block 1	.10	.13	.12	.13
Block 2	.12	.13	.08	.12
Block 3	.15	.14	.09	.13
Block 4	.12	.13	.10	.12

Note. $N = 62$. Participants' performance scores were computed as the proportion of correctly classified music pieces.

learn more. Participants were provided with three options to indicate their responses: *blocked*, *about the same*, or *interleaved*. Finally, participants completed the MET and indicated their years of musical experience before they were debriefed and thanked.

Results

Interleaving Effect

To examine participants' test performance, we computed the proportion of novel music pieces whose composers they correctly identified in the interleaved and blocked conditions. Participants' proportion scores ranged from 0% to 33% in the interleaved condition and 0% to 25% in the blocked condition. In addition, out of 71 participants, 19 (27%) performed below chance level (i.e., below an accuracy level of 1 out of 12 trials answered correctly) in the interleaved condition, while 26 (37%) performed below chance level in the blocked condition. Thus, it appears that the task was indeed relatively difficult for the nonexpert participants. In particular, we identified nine participants (13%) who scored below chance level across both the interleaved and blocked conditions. These nine participants were excluded from subsequent analyses due to their low performance accuracy, leaving a final sample of 62 participants.

A 2 (sequencing: blocked vs. interleaved) × 4 (test block) repeated measures analysis of variance (ANOVA) was conducted. As predicted, an interleaving effect in learning musical styles obtained, whereby interleaved study ($M = .12$, $SD = .076$) led to better test performance than did blocked study ($M = .097$, $SD = .059$), as measured by the proportion of correctly classified novel music pieces, $F(1, 61) = 4.15$, $p = .046$, $\eta_p^2 = .064$. The Sequencing × Test Block interaction was nonsignificant, $F(3, 183) = 1.94$, $p = .12$, $\eta_p^2 = .031$, as was the main effect of test block, $F(3, 183) = 0.72$, $p = .54$, $\eta_p^2 = .012$, indicating that the interleaving effect did not vary across the four test blocks and that there were no significant differences in participants' overall test performance across test blocks. Mean performance scores and standard deviations for the individual conditions are presented in Table 1.

Participants' overall test performance as well as the difference between participants' scores in the interleaved and blocked conditions did not significantly correlate with

Table 2. Observed Frequencies of Participants' Metacognitive Judgments and Actual Test Performance Across Outcomes.

	Blocked > Interleaved	Blocked = Interleaved	Interleaved > Blocked
Metacognitive judgment	31 (50)	24 (39)	7 (11)
Actual test performance	22 (36)	10 (16)	30 (48)

Note. $N = 62$. Numbers in parentheses indicate row percentages.

their musical sophistication (as measured by their scores on the five Gold-MSI subscales and general musical sophistication factor), musical competence (as assessed by their scores on the MET rhythm and melody subtests and full test), years of musical experience, or their mean liking ratings of the music pieces, all *p*s $> .05$. Means and standard deviations of participants' scores on the Gold-MSI and MET appear as supplemental material in the online version of the article. In addition, a paired-samples *t* test revealed that participants did not express differential liking for the music pieces of interleaved ($M = 3.97$, $SD = 0.81$) versus blocked ($M = 4.06$, $SD = 0.83$) composers, $t(61) = 1.43$, $p = .16$.

Metacognitive Judgments

Participants' metacognitive judgments were markedly at odds with their actual test performance, whereby most participants failed to appreciate the benefits of interleaving (see Table 2). Overall, 65% of the participants performed equally well (16%) or better (48%) with interleaved study than with blocked study. Yet, 89% of the participants thought that blocking was as good as (39%) or more helpful than (50%) interleaving.

We compared participants' metacognitive judgments and actual test performance across the three outcomes: (a) blocking > interleaving, (b) blocking = interleaving, and (c) interleaving > blocking. A chi-square test of independence revealed a significant difference in the distribution of frequencies for the three outcomes across participants' metacognitive judgments versus actual test performance, $\chi^2(2, N = 124) = 21.59$, $p < .001$. In other words, learners' metacognitive judgments did not predict their actual test performance. To explicate this result, we further conducted chi-square goodness-of-fit tests on participants' metacognitive judgments versus actual test performance on each of the three outcomes. On the outcome of blocking > interleaving, there was no significant difference between the observed and expected frequencies of participants' metacognitive judgments versus actual test performance, $\chi^2(1, N = 53) = 1.53$, $p = .22$. However, the observed frequencies of participants' metacognitive judgments versus actual test performance were not equally distributed on the outcome of blocking = interleaving, $\chi^2(1, N = 34) = 5.77$, $p = .016$, and on the outcome of

Table 3. Mean Interleaved and Blocked Performance Scores by Metacognitive Judgment.

	Interleaved Performance		Blocked Performance	
Metacognitive Judgment	*M*	*SD*	*M*	*SD*
Blocked > interleaved (N = 31)	.13	.08	.10	.06
Blocked = interleaved (N = 24)	.11	.07	.10	.05
Interleaved > blocked (N = 7)	.13	.09	.08	.06

Note. N = 62. Participants' performance scores were computed as the proportion of correctly classified music pieces.

interleaving > blocking, $\chi^2(1, N = 37) = 14.30, p < .001$. Specifically, more participants misjudged blocking to be as good as interleaving than it actually was, and fewer participants recognized that interleaving was better than blocking than it actually was. This suggests that learners generally displayed low metacognitive accuracy in judging the relative effectiveness of interleaving over blocking. For each metacognitive judgment, the means and standard deviations of participants' actual interleaved and blocked performance scores are presented in Table 3.

Discussion

Our study revealed that participants with 4 or fewer years of musical experience were more accurate in classifying novel music pieces by composers whose works had earlier been presented in an interleaved, as opposed to a blocked, schedule. Although this task appeared relatively difficult for nonexpert listeners, as indicated by some participants' performance that fell below chance level, the majority of the participants were, to some extent, capable of explicitly identifying the exact composer of a particular music piece. Hence, while previous work has often examined novices' musical stylistic sensitivity more broadly through their ability to judge whether two musical excerpts came from the same piece of music (Gardner, 1973) or were written by the same composer (Addessi et al., 1995–1996), our study extends this level of discriminatory ability to show that nonexperts are capable of making finer grained distinctions among specific individual composers. Importantly, this finding offers support for the utility of interleaving in enhancing the learning of music composers' styles and extends the benefits of interleaving to the auditory modality and domain of musical listening beyond visual stimuli that have been the focus of past research on category induction (Birnbaum et al., 2013; Kornell & Bjork, 2008).

The superior inductive learning associated with interleaved presentations of music pieces in our study could potentially be attributed to the enhanced discriminative contrast that interleaving affords (Birnbaum et al., 2013; Goldstone & Steyvers, 2001; Kang & Pashler, 2012). Through juxtaposing varied musical categories in succession, interleaving could have facilitated contrasts of different composers' styles and promoted the detection of stylistic differences, thereby enhancing subsequent categorization when participants were presented with novel music pieces by these same composers. At the same time, spacing exemplars apart during interleaving has been associated with less mind wandering and greater engagement with the study material compared to blocked study in which exemplars from the same category are repeated back to back (Metcalfe & Xu, 2016). Accordingly, listening to music pieces by different composers in an interleaved manner could have sustained participants' attention and interest due to an orienting response to novel stimuli (Kahneman, 1973). In line with research linking higher cognitive engagement during musical practice to more efficient learning (McPherson & McCormick, 1999), such greater engagement during interleaved study could then have produced better test performance when classifying novel music pieces, relative to successively listening to music pieces by the same composer during blocked study in which participants' attention may have lapsed.

However, although the majority of participants had profited more from interleaving than blocking, most participants remained unaware of this benefit and instead believed that blocking had been as good as or more effective than interleaving. These inaccurate metacognitive judgments echo the illusions of the efficacy of blocking endorsed by learners in other prior studies (e.g., Kornell & Bjork, 2008; Zulkiply et al., 2012). The mismatch between participants' perceptions and their actual performance may stem from a belief that listening to multiple exemplars from the same composer consecutively (i.e., blocking) rather than temporally spaced apart (i.e., interleaving) promotes successful abstraction of the defining characteristics of the composer's style and/or a cognitive heuristic that a sense of fluency from repeatedly listening to the same composer's works indicates better learning (Yan et al., 2016). Accordingly, when judging the usefulness of interleaving, participants may have been swayed by their subjective sense of disfluency during learning, which could then have (mis)led them to believe that interleaving was less helpful than blocking.

Educational Implications

Notwithstanding its modest effect size, a statistically reliable interleaving advantage emerged. More research is necessary to develop a deeper understanding of the mechanisms underlying interleaving to illuminate its full potential and inform the proposal of more definitive practical recommendations. At the same time, however, it would be erroneous to unilaterally conclude that small effects, just because they are small, are not practically meaningful at all. Instead, it is noteworthy that the nonexpert participants in our study benefited from interleaving even without prior training on this learning approach and displayed enhanced sensitivity to fine-grained differences between various composers' styles even when musical form had been kept constant and especially when the discrimination task had been designed to be relatively challenging with each musical excerpt presented for only 5 seconds during the study phase. In light of all these factors, interleaving may serve as a promising technique that is relatively easy and inexpensive to implement for supporting inductive learning in appropriate music educational settings.

Accordingly, music educators can incorporate interleaving in their classes to introduce beginners to diverse musical styles and guide students to distinguish among the unique characteristics of different composers' works. For example, during a single lesson, students can be exposed to musical works from various composers in intermixed succession instead of pieces from a single composer only. More broadly, when discussing musical styles from a particular historical period (as textbook authors tend to do when chronologically outlining the historical development of music), teachers may also remind students of the features of musical works from other periods and review some of these exemplars to facilitate discriminative contrast. By interleaving exemplars from each musical category, more meaningful learning may take place.

However, to reap the advantages of interleaving, both students and educators must be convinced about the efficacy of this approach and to use it as a strategy in their learning and teaching. As many studies including ours have shown, learners often doubt the efficacy of interleaving even after they have experienced it and misjudge blocking to be more beneficial instead (e.g., Kornell & Bjork, 2008; Zulkiply et al., 2012). Such metacognitive illusions about the effectiveness of blocking often stem from erroneous a priori beliefs and a misleading sense of fluency during blocked study that have proven remarkably difficult to overturn (Yan et al., 2016). Moreover, music educators too have advocated repetition and intense drills of new musical skills "to master automaticity" (McCarthy et al., 2003, p. 51; for a discussion, see Stambaugh, 2011). While such advice is well intentioned and surely holds some truth (as the familiar adage "practice makes perfect" goes), it is important to consider *how* new information is repeated. As a growing body of research attests, back-to-back repetitions and blocked practice are often largely ineffective compared to interleaved practice, particularly when durable learning is concerned (e.g., Birnbaum et al., 2013; Carter & Grahn, 2016; Kang, 2016; Kornell & Bjork, 2008; Roediger & Pyc, 2012; Rohrer, 2012). To optimize musical learning, it is thus crucial that music education practice is better informed by principles that are well grounded in cognitive psychology (see Wong & Lim, 2017, for a discussion), including the use of interleaving to learn various music composers' styles, for which some benefits have been empirically established in this study.

Future Directions

Our study focused on the discrimination of individual composers' styles with each composer serving as a specific novel "category" to be learned. To ensure that any effects observed would be generalizable across various eras, we selected composers from each of the four major historical periods in Western classical music (baroque, classical, romantic, and 20th century), although it should be noted that the focus of our study was not on eras per se. Hence, future research may extend this paradigm to investigate the interleaving effect in conjunction with broader musical categories, such as those related to historical periods or cultural contexts. Given that the demands on musical stylistic competence increase with closer chronological distance between the historical periods of the pieces being compared (Addessi et al., 1995–1996), the difficulty of the discrimination task may be further compounded when the musical works to be categorized share a high degree of similarity within eras and between composers. For instance, differentiating music pieces by composers within the same historical period (e.g., classical period) may pose greater difficulty for novices when these composers have relatively more similar (e.g., Mozart vs. Haydn) than different (e.g., Mozart vs. Beethoven) styles. To test this possibility, future empirical work can manipulate stylistic similarity when presenting music pieces by composers from the same historical period, as informed by multidimensional scaling (MDS) of composer proximity based on various attributes such as heavy/light, angular/rounded, and pleasing/unpleasing (Gromko, 1993; see also Lim & Goh, 2012, 2013, for MDS procedures). Participants' hits (correct identification of the composer of a given music piece) and false alarms (confusions between composers with similar styles) can then be assessed to enable a more nuanced understanding of the effects of interleaved versus blocked musical presentations.

To test the parameters of the interleaving effect, future work may investigate its efficacy across learner characteristics, varying levels of task complexity and pedagogical approaches. For instance, while the nonexpert participants in our study were recruited based on their level of musical experience, dissociating learners' musical experience from their prior familiarity with the to-be-learned styles may be useful in future research. Depending on learners' musical background, the interleaving effect may be moderated by the dosage of initial instruction (for a discussion, see Dunlosky et al., 2013). For example, beginner music students may gain from being exposed to more and/or longer exemplars when they are first introduced to relatively complex musical works such as chamber or orchestral works, beyond our study's focus on preludes written for the piano, keyboard, harpsichord, or organ. Moreover, from a pedagogical perspective, providing scaffolding by explicitly directing students' attention to critical target features (e.g., salient musical characteristics) during initial listening may produce more meaningful learning. Accordingly, determining how the interleaving effect interacts with such factors may illuminate the ways in which its benefits can be optimized across diverse musical learning contexts.

In addition, future qualitative research may be vital in examining the mechanisms and processes through which nonexpert listeners arrive at conclusions about composers' styles. For instance, after listening to different composers' works and classifying these, participants can be asked to describe the characteristic features of each style that they have identified. This may allow for a better understanding of how listeners aurally identify similarities and differences across music pieces.

Conclusion

Learning to identify and distinguish among various musical styles is integral to meaningful music listening and the development of musical understanding (e.g., Addessi et al., 1995–1996; Madsen & Geringer, 2000–2001) but often poses a challenge for nonexperts. Moreover, while music students are often encouraged to listen to a wide range of musical works to develop better aural awareness, little empirical research has been conducted to determine how such training can be effectively carried out to increase sensitivity to music composers' styles. To address these issues in music education, we pioneered an investigation into the use of interleaving when learning categories in musical contexts. In this study, we showed that interleaved listening of different composers' works enhances nonexperts' learning of these composers' styles. Our findings offer a promising approach to address challenges in learning musical categories while establishing that the interleaving effect in category induction is not only confined to visual information but also extends to auditory stimuli. Our hope is that this work will foster improvements in meaningful music educational outcomes through encouraging students and instructors to embrace effective techniques firmly rooted in the cognitive science of learning.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported in part by a National University of Singapore Faculty of Arts and Social Sciences Heads and Deanery Research Support Scheme grant (R-581-000-192-101) awarded to Stephen Wee Hun Lim.

ORCID iDs

Sarah Shi Hui Wong https://orcid.org/0000-0003-4243-212X
Stephen Wee Hun Lim https://orcid.org/0000-0003-3636-7587

Supplemental Material

Appendices 1 and 2 are available in the online version of the article at https://doi.org/10.1177/0022429420908312.

References

ABRSM. (2017). *ABRSM: What is a graded exam?* http://us.abrsm.org/en/our-exams/what-is-a-graded-music-exam/

Addessi, A. R., Baroni, M., Luzzi, C., & Tafuri, J. (1995–1996). The development of musical stylistic competence in children. *Bulletin of the Council for Research in Music Education*, *127*, 8–15.

Austin, J. R., & Berg, M. H. (2006). Exploring music practice among sixth-grade band and orchestra students. *Psychology of Music*, *34*, 535–558. https://doi.org/10.1177/0305735606067170

Baroni, M. (2006). Hearing musical style: Cognitive and creative problems. In I. Deliège & G. Higgins (Eds.), *Musical creativity: Multidiscplinary research in theory and practice* (pp. 78–93). Psychology Press.

Baroni, M. (2009). A different kind of similarity: The recognition of style in listening. *Musicae Scientiae, Discussion Forum*, *4B*, 119–138.

Barry, N. H. (1992). The effects of practice strategies, individual differences in cognitive style, and gender upon technical accuracy and musicality of student instrumental performance. *Psychology of Music*, *20*, 112–123. https://doi.org/10.1177/0305735692202002

Barry, N. H. (2007). A qualitative study of applied music lessons and subsequent student practice sessions. *Contributions to Music Education*, *34*, 51–65.

Birnbaum, M. S., Kornell, N., Bjork, E. L., & Bjork, R. A. (2013). Why interleaving enhances inductive learning: The roles of discrimination and retrieval. *Memory & Cognition*, *41*, 392–402. https://doi.org/10.3758/s13421-012-0272-7

Carlsen, J. C. (1969). Some problems in musical learning. *Journal of Research in Music Education*, *17*, 7–12. https://doi.org/10.2307/3344178

Carpenter, S. K. (2014). Spacing and interleaving of study and practice. In V. A. Benassi, C. E. Overson, & C. M. Hakala (Eds.), *Applying science of learning in education: Infusing psychological science into the curriculum* (pp. 131–141). http://teachpsych.org/ebooks/asle2014/index.php

Carter, C. E., & Grahn, J. A. (2016). Optimizing music learning: Exploring how blocked and interleaved practice schedules affect advanced performance. *Frontiers in Psychology*, *7*, Article 1251. https://doi.org/10.3389/fpsyg.2016.01251

Cepeda, N. J., Pashler, H., Vul, E., Wixted, J. T., & Rohrer, D. (2006). Distributed practice in verbal recall tasks: A review and quantitative synthesis. *Psychological Bulletin*, *132*, 354–380. https://doi.org/10.1037/0033-2909.132.3.354

Cohen, M. A., Horowitz, T. S., & Wolfe, J. M. (2009). Auditory recognition memory is inferior to visual recognition memory. *Proceedings of the National Academy of Sciences of the United States of America*, *106*, 6008–6010. https://doi.org/10.1073/pnas.0811884106

Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic Bulletin & Review*, *12*, 769–786. https://doi.org/10.3758/BF03196772

Dalla Bella, S., & Peretz, I. (2005). Differentiation of classical music requires little learning but rhythm. *Cognition*, *96*, B65–B78. https://doi.org/10.1016/j.cognition.2004.12.005

Dempster, F. N. (1996). Distributing and managing the conditions of encoding and practice. In E. L. Bjork & R. A. Bjork (Eds.), *Handbook of perception and cognition: Memory* (pp. 317–344). Academic Press.

Department for Education, England. (2013). *National curriculum in England: Music programmes of study*. https://www.gov.uk/government/publications/national-curriculum-in-england-music-programmes-of-study

Dominowski, R. L. (1965). Role of memory in concept learning. *Psychological Bulletin*, *63*, 271–280. https://doi.org/10.1037/h0021801

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, *14*, 4–58. https://doi.org/10.1177/1529100612453266

Gardner, H. (1973). Children's senitivity to musical styles. *Merrill-Palmer Quarterly of Behavior and Development*, *19*, 67–77.

Goldstone, R. L., & Steyvers, M. (2001). The sensitization and differentiation of dimensions during category learning. *Journal of Experimental Psychology: General*, *130*, 116–139. https://doi.org/10.1037//0096-3445.130.1.116

Gromko, J. E. (1993). Perceptual differences between expert and novice music listeners: A multidimensional scaling analysis. *Psychology of Music*, *21*, 34–47. https://doi.org/10.1177/030573569302100103

Hallam, S. (2010). 21st century conceptions of musical ability. *Psychology of Music*, *38*, 308-330. https://doi.org/10.1177/0305735609351922

Hansen, M., Wallentin, M., & Vuust, P. (2012). Working memory and musical competence of musicians and non-musicians. *Psychology of Music*, *41*, 779–793. https://doi.org/10.1177/0305735612452186

Hargreaves, D. J., & North, A. C. (1999). Developing concepts of musical style. *Musicae Scientiae*, *3*, 193–216. https://doi.org/10.1177/102986499900300203

Kahneman, D. (1973). *Attention and effort*. Prentice-Hall.

Kang, S. H. K. (2016). Spaced repetition promotes efficient and effective learning: Policy implications for instruction. *Policy Insights from the Behavioral and Brain Sciences*, *3*, 12–19. https://doi.org/10.1177/2372732215624708

Kang, S. H. K., & Pashler, H. (2012). Learning painting styles: Spacing is advantageous when it promotes discriminative contrast. *Applied Cognitive Psychology*, *26*, 97–103. https://doi.org/10.1002/acp.1801

Klausmeier, H. J., & Harris, C. W. (1966). *Analyses of concept learning*. Academic Press.

Kornell, N., & Bjork, R. A. (2008). Learning concepts and categories: Is spacing the "enemy of induction"? *Psychological Science*, *19*, 585–592. https://doi.org/10.1111/j.1467-9280.2008.02127.x

Kornell, N., Castel, A. D., Eich, T. S., & Bjork, R. A. (2010). Spacing as the friend of both memory and induction in young and older adults. *Psychology and Aging*, *25*, 498–503. https://doi.org/10.1037/a0017807

Kruschke, J. K. (1992). ALCOVE: An exemplar-based connectionist model of category learning. *Psychological Review*, *99*, 22–44. https://doi.org/10.1037/0033-295X.99.1.22

Kruschke, J. K. (2006). Concept learning and categorization: Models. In *Encyclopedia of cognitive science*. John Wiley. https://doi.org/10.1002/0470018860.s00047

Leon-Guerrero, A. (2008). Self-regulation strategies used by student musicians during music practice. *Music Education Research*, *10*, 91–106. https://doi.org/10.1080/14613800701871439

Lim, S. W. H., & Goh, W. D. (2012). Variability and recognition memory: Are there analogous indexical effects in music and speech? *Journal of Cognitive Psychology*, *24*, 602–616. https://doi.org/10.1080/20445911.2012.674029

Lim, S. W. H., & Goh, W. D. (2013). Articulation effects in melody recognition memory. *The Quarterly Journal of Experimental Psychology*, *66*, 1774–1792. https://doi.org/10.1080/17470218.2013.766758

Madsen, C. K., & Geringer, J. M. (2000–2001). A focus of attention model for meaningful listening. *Bulletin of the Council for Research in Music Education*, *147*, 103–108.

Maynard, L. M. (2006). The role of repetition in the practice sessions of artist teachers and their students. *Bulletin of the Council for Research in Music Education*, *167*, 61–72.

McCarthy, M., Carlow, R., Gabriele, K., Hall, M., Moore, J., & Woody, R. (2003). *Better practice in music education*. Maryland State Department of Education.

McPherson, G. E., & McCormick, J. (1999). Motivational and self-regulated learning components of musical practice. *Bulletin of the Council for Research in Music Education*, *141*, 98–102.

Metcalfe, J., & Xu, J. (2016). People mind wander more during massed than spaced inductive learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *42*, 978–984. https://doi.org/10.1037/xlm0000216

Meyer, L. B. (1989). *Style and music: Theory, history, and ideology*. The University of Chicago Press.

Ministry of Education, Singapore. (2015). *Music teaching and learning syllabus: Primary & lower secondary*. https://www.moe.gov.sg/education/syllabuses/arts-education/

Müllensiefen, D., Gingras, B., Musil, J., & Stewart, L. (2014). The musicality of non-musicians: An index for assessing musical sophistication in the general population. *PLoS ONE*, *9*, Article e89642. https://doi.org/10.1371/journal.pone.0089642

National Coalition for Core Arts Standards. (2014). *National core music standards*. http://www.nationalartsstandards.org/

Pollard-Gott, L. (1983). Emergence of thematic concepts in repeated listening to music. *Cognitive Psychology*, *15*, 66–94. https://doi.org/10.1016/0010-0285(83)90004-X

Psychology Software Tools, Inc. [E-Prime 2.0]. (2012). http://www.pstnet.com.

Pyc, M. A., & Rawson, K. A. (2009). Testing the retrieval effort hypothesis: Does greater difficulty correctly recalling information lead to higher levels of memory? *Journal of Memory and Language*, *60*, 437–447. https://doi.org/10.1016/j.jml.2009.01.004

Roediger, H. L., & Pyc, M. A. (2012). Inexpensive techniques to improve education: Applying cognitive psychology to enhance educational practice. *Journal of Applied Research in Memory and Cognition*, *1*, 242–248. https://doi.org/10.1016/j.jarmac.2012.09.002

Rohrer, D. (2012). Interleaving helps students distinguish among similar concepts. *Educational Psychology Review*, *24*, 355–367. https://doi.org/10.1007/s10648-012-9201-3

Rohrer, D., Dedrick, R. F., & Burgess, K. (2014). The benefit of interleaved mathematics practice is not limited to superficially similar kinds of problems. *Psychonomic Bulletin & Review*, *21*, 1323–1330. https://doi.org/10.3758/s13423-014-0588-3

Rohwer, D., & Polk, J. (2006). Practice behaviors of eighth-grade instrumental musicians. *Journal of Research in Music Education*, *54*, 350–362. https://doi.org/10.1177/002242940605400407

Rosch, E., & Mervis, C. B. (1975). Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology*, *7*, 573–605. https://doi.org/10.1016/0010-0285(75)90024-9

Seabrook, R., Brown, G. D. A., & Solity, J. E. (2005). Distributed and massed practice: From laboratory to classroom. *Applied Cognitive Psychology*, *19*, 107–122. https://doi.org/10.1002/acp.1066

Seashore, C. E. (1915). The measurement of musical talent. *The Musical Quarterly*, *1*, 129–148. https://doi.org/10.1093/mq/I.1.129

Shea, J. B., & Morgan, R. L. (1979). Contextual interference effects on the acquisition, retention, and transfer of a motor skill. *Journal of Experimental Psychology: Human Learning and Memory*, *5*, 179–187. https://doi.org/10.1037/0278-7393.5.2.179

Spalding, T. L., & Ross, B. H. (2000). Concept learning and feature interpretation. *Memory & Cognition*, *28*, 439–451. https://doi.org/10.3758/BF03198559

Stambaugh, L. A. (2011). When repetition isn't the best practice strategy: Effects of blocked and random practice schedules. *Journal of Research in Music Education*, *58*, 368–383. https://doi.org/10.1177/0022429410385945

Stead, E. P., & Lum, C. H. (2014). The development of the general music programme in primary and secondary schools. In J. Zubillaga-Pow & C. K. Ho (Eds.), *Singapore soundscape: Musical renaissance of a global city* (pp. 235–250). National Library Board.

Storino, M., Dalmonte, R., & Baroni, M. (2007). An investigation on the perception of musical style. *Music Perception*, *24*, 417–432. https://doi.org/10.1525/mp.2007.24.5.417

Tauber, S. K., Dunlosky, J., Rawson, K. A., Wahlheim, C. N., & Jacoby, L. L. (2013). Self-regulated learning of a natural category: Do people interleave or block exemplars during study? *Psychonomic Bulletin & Review*, *20*, 356–363. https://doi.org/10.3758/s13423-012-0319-6

Taylor, K., & Rohrer, D. (2010). The effects of interleaved practice. *Applied Cognitive Psychology*, *24*, 837–848. https://doi.org/10.1002/acp.1598

Underwood, B. J. (1952). An orientation for research on thinking. *Psychological Review*, *59*, 209–220. https://doi.org/10.1037/h0059415

Vlach, H. A., Sandhofer, C. M., & Kornell, N. (2008). The spacing effect in children's memory and category induction. *Cognition*, *109*, 163–167. https://doi.org/10.1016/j.cognition.2008.07.013

Wallentin, M., Nielsen, A. H., Friis-Olivarius, M., Vuust, C., & Vuust, P. (2010). The Musical Ear Test, a new reliable test for measuring musical competence. *Learning and Individual Differences*, *20*, 188–196. https://doi.org/10.1016/j.lindif.2010.02.004

Wong, S. S. H., & Lim, S. W. H. (2017). Mental imagery boosts music compositional creativity. *PLoS ONE*, *12*(3), Article e0174009. https://doi.org/10.1371/journal.pone.0174009

Yan, V. X., Bjork, E. L., & Bjork, R. A. (2016). On the difficulty of mending metacognitive illusions: A priori theories, fluency effects, and misattributions of the interleaving benefit. *Journal of Experimental Psychology: General*, *145*, 918–933. https://doi.org/10.1037/xge0000177

Zulkiply, N., McLean, J., Burt, J. S., & Bath, D. (2012). Spacing and induction: Application to exemplars presented as auditory and visual text. *Learning and Instruction*, *22*, 215–221. https://doi.org/10.1016/j.learninstruc.2011.11.002

Author Biographies

Sarah Shi Hui Wong is an instructor and doctoral candidate at the National University of Singapore, Department of Psychology. Her research interests include integrating and applying the sciences of human learning and flourishing in higher and music education.

Amanda Chern Min Low graduated from the National University of Singapore, Department of Psychology with first-class honors. Her research interests relate to music, memory, and cognition.

Sean H. K. Kang is a senior lecturer in the science of learning at the University of Melbourne, Graduate School of Education. His research interests include applying the cognitive science of human learning and memory toward improving instruction.

Stephen Wee Hun Lim is an associate professor at the National University of Singapore, Department of Psychology. His research interests relate to the counterintuitive cognitive strategies of teaching, learning, and flourishing in higher and music education.

Submitted June 26, 2018; accepted June 12, 2019.