Improving Students' Practice and Performance of Music by Incorporating Cognitive Science into Conservatory Curricula

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Abstract

Relatively few music educators integrate relevant research findings from the field of cognitive science into their classroom teaching, despite the many benefits that engaging with this area can have for the practice and performance of music. In this paper, we examine a new module that aimed to teach cognitive and performance science to conservatory students. The findings from our study suggest that the module helped students practice more efficiently, tackle challenges during practice sessions, approach practice more analytically, discover mind-body connections, and perform more confidently. Further, the module fostered a sense of community among the students. The successes of this module provide a strong case for the benefits of incorporating cognitive science into the curriculum of higher music education.

Keywords

Psychology, Performance Science, Higher Music Education, Interdisciplinary Pedagogy, Conservatory Curricula

Introduction

Cognitive science (CS), including psychology and performance science, has informed best practice in a range of applied areas such as sports and pilot training (e.g., Williams & Leffingwell, 2002), and is increasingly providing insights into the practice and performance of music (e.g., Parncutt & McPherson, 2002; Williamon, 2004; Thompson, et al., 2006). Despite the growing literature connecting CS and music performance, there is little awareness and

engagement with this knowledge from most university-level music students, primarily because it is not being taught in their classrooms. Indeed, modules related to the psychology of music performance are not offered in many conservatories of music, with the notable exception of Juilliard and a small handful of other institutions.

Due to this gap, we aim to evaluate the impact of teaching cognitive and performance science to conservatory music students. A new module entitled 'The Psychology of Music Performance' that was taught by the first author to undergraduate music students at [conservatory name] was evaluated for this purpose. This module presented relevant findings from the psychology of music and performance science through a blend of traditional teaching methods (e.g., lectures, readings) and student-centered learning approaches in order to introduce music students to psychological concepts in an immersive and interesting way. The module aimed to help students add analytical, empirical tools to their set of practice and performance techniques, thereby bringing maximum benefit to their practice and performance of music. We believe that our findings on the efficacy and impact of the module support the case for greater integration of CS concepts into the classrooms and curricula of higher education in music.

Methods

Participants

13 out of 21 students enrolled in *The Psychology of Music Performance* module volunteered to participate in this study (participation refers to allowing the research team access to their de-identified module materials for analysis). All but one of the participants were music performance majors enrolled in [conservatory name]; the remaining student is a serious

musician who plays in the [university name] symphony orchestra. All student data were coded using participant numbers (P1-P13) before analysis.

Module Overview

Lessons in the 13-week module were comprised of interactive lectures, in-class discussions, and activities (e.g., educational games, demos). The topics discussed in the module include:

- Introduction to the Psychology of Music and Cognitive Science
- Mind and body connections
- Efficient and deliberate practice techniques; problem solving approaches; motivation and concentration
- Strategies and meta-strategies for individual practice, ensemble practice, sight-reading, and improvisation
- Anxiety and stage fright; relaxation techniques
- Memory and memorization
- Pitch and key perception; timing and rhythm perception
- Learning and expectation mechanisms
- Emotion and Expressiveness
- Communicating musical structure and emotion
- Performance aspects; musical and psychological factors that influence performance assessment
- Analytical practice vs performance flow
- Musician's health and wellness

Student Assessment

Students completed two main assignments in the module, a weekly blog post, which prompted students to reflect on how the weekly topic(s) relate to their practice and performance of music, and an individual research project. In the project, students implemented a strategy of their choice (from those presented in class) for one month, collected "data" on themselves, wrote a report, and gave an in-class presentation on their findings. The breakdown of research topics included: Deliberate practice (5), performance anxiety (4), sight-reading (2), health and wellbeing (1), and memory (1). An in-depth discussion of the module's teaching and learning methods is not possible here, and will be presented in another paper.

Focus group discussion

At the end of term, semi-structured focus group discussions (FGDs), facilitated by the teaching assistant, were held with 6-7 students per group. The FGDs were conducted online and lasted approximately 90 minutes. The audio recordings were transcribed, proofread, and then double-checked to ensure accuracy of transcription. Sentence fillers such as "um" were removed from the quotes below for ease of reading.

Thematic Analysis

To analyze the FGD data, we used thematic analysis (Braun and Clarke, 2006; Nowell et al., 2017). First, the FGD data were coded according to the meanings that emerged from the text through an inductive, interpretive approach. After this process, clusters of codes were identified as themes. These themes were then evaluated by both authors and revised in order to comprehensively assess whether or not the module was beneficial for the students, and in what ways.

Results and Discussion

From our thematic analysis of the focus group discussions, we identified six themes in the data, as shown in Table 1.

[Insert Table 1 here]

Theme 1: More efficient practice

Students reflected in the FGDs that the module influenced their mindsets and practice habits by encouraging them to be more intentional with their practice sessions, learn and implement specific strategies, and utilize techniques to structure practice. This allowed students to increase the efficiency of their practice sessions. For instance, some students learned to set goals for their practice sessions, which improved their motivation and ability to assess the extent of their improvement. Setting goals provided clear parameters of what to achieve instead of simply aiming to be "better" or "perfect". By setting clear goals and being aware of the pitfalls of autopilot mode, students were able to limit "mindless repetition" during practice sessions. When asked about their biggest takeaway from the module, five students mentioned goal-setting; for example:

> I think [my biggest takeaway] is the practice strategy… you should make a plan and practice it and then you should evaluate yourself and then… you make another plan. I think it's very useful. Because we always [want to] be perfect, but it's hard to find a healthy way to develop a healthy practice. Sometimes we just struggle and don't know what to do. (P3, FGD1)

Other students mentioned that specific strategies, such as mental rehearsal, interleaved memorization techniques, or simply taking more frequent breaks during practice, improved the efficiency of their practice sessions. During the FGDs, three students explicitly mentioned that

the implementation of strategies covered in the module helped them shorten their practice sessions:

> Before [taking this module], I never really learned about practice that in-depth. So practicing was more like a routine… I just take my instrument, then I just run through it over and over again. I didn't realize that, what I was doing was actually kind of wasting time, it was not very effective. Then, after this module, I feel like… I was able to know what I was doing… I had a goal, like what I want to achieve for each practice session… it was more productive for me. (P1, FGD1)

Deliberate practice was the most popular topic for the individual research projects, with a total of 5 students attempting to either set goals, structure their practice sessions, or use new techniques to analyze/learn their score. Students often uncovered useful insights on their practice through their research projects, where they explored the applicability of different strategies for their practice.

Theme 2: Better at solving problems during music practice

Students came into the module with a diverse range of challenges, and many expressed that the strategies they learned in the module helped them address these problems. This was possible due to the breadth of topics explored, as well as the opportunity for in-depth, applied learning through individual projects.

Regarding the breadth of the module, students found that exposure to many strategies was akin to a list of troubleshooting techniques. Virtually all students remarked that they took away something valuable from the module in this regard, whether it was a particular technique or a

shift in mindset. In fact, all students mentioned, either in the FGDs or research reports, that they would like to carry forward at least one strategy from the module.

Beyond breadth, students were provided with the opportunity, in their research projects, to apply a strategy of their choice to tackle a musical or practice-related challenge, which they found to be particularly helpful. Students had varying degrees of success with their strategies, but all students gained a greater understanding of how to approach their challenges:

> When you do the readings… you know some concepts, but you don't know… if [they] actually work for you. So I think the individual project is really to try out things… [and see] whether it works for you or not. (P2, FGD1)

A contributing factor to the perceived usefulness of the module comes from how the strategies were presented in a structured and comprehensive way. This helped to provide an easy reference to troubleshoot their current and future problems.

Moreover, students also displayed analytical problem solving skills by choosing strategies that were well-suited for their particular situation. Such discernment is possible due to an in-depth understanding of strategies, and seeing connections between topics. Some students also decided to do further research (outside of class) when they did not understand a topic or wanted more information. The following example illustrates how increased self-awareness helped a student see how to use less conventional methods to solve their problem:

> [For] some anxiety-coping mechanisms like working out or breathing, some things that were mentioned it was like… 'okay, I am already kind of doing these things, but I still experience anxiety'… So for my project, I had to kind of think my way out of this, like maybe if I applied deliberate practice… like ways that

> I can remember the score better, maybe that will help, so… maybe that strategy was taught to help us play better, but for me it was helping me for my anxieties, in a sense. (P5, FGD1)

Theme 3: Analytical-approach to monitoring practice and performance

The ability to monitor one's progress and reflect analytically on practice and performance is crucial to the life of a musician. Thus, students valued the discussion of these skills in the module. For instance, the instructor explained how musicians can monitor their progress quantitatively by assigning measurements to abstract concepts (e.g., by having peers or instructors provide ratings of emotion conveyed during performance, or by quantifying the number of bars performed without error while sight-reading an excerpt, etc) in order to evaluate their progress and improvement. A student remarked that it is helpful to quantify and visualize more intangible concepts (e.g., "appropriateness of style", "musicianship", "expression", etc), while another student remarked that they internalized this mindset by the end of the module (even though most students were initially unfamiliar with this quantitative, analytical approach).

In addition to quantifying and analysing aspects of practice and performance, students also reflected regularly on class material through their weekly blog posts. Many students claimed that this allowed them to better understand themselves, and recognize their strengths and weaknesses, while digesting the course material. The assessment format (requiring weekly reflective posts) imposed what was generally seen as a welcome structure, with one student summarizing the learning regimen as "forced, but in a good way", because reflection was seen as a positive but often neglected habit due to time limitations, for example:

> I think, because of the student-centric approach, like all the… research, the blog entries, it really forced us to get to know what we are learning on that week itself… because we are forced to read all the readings so that we can reflect, and I mean, reflecting is always good. (P2, FGD1)

Some students aim to adopt regular reflection moving forward, as a means of approaching their practice more analytically.

Theme 4: Better understanding of the mind-body connection and the importance of health for music performance

An often overlooked area in music education is that of musicians' health and wellbeing. Hence, it was encouraging to see that students seemed to pay more attention towards their physical and mental health due to the module. For instance, after realizing the benefits of exercise for performance, three students mentioned that they decided to incorporate exercise into their lifestyle or pre-performance routine, with one implementing this change during the semester and discovering its efficacy for reducing performance anxiety (this topic will be further explored in the next theme).

> For the performance aspect, [I remember] how Prof [Name] mentioned about exercising, so I went to try that, like I really went on the treadmill to run before my performance, and I'm not sure [whether] it is a psychological effect or it really worked, but yeah, I was less nervous. (P1, FGD1)

Other students benefitted from taking breaks in-between their practice sessions, and using mental rehearsal as an alternative to playing their instruments to conserve energy and physical demands on their body. A few students also implemented strategies related to health and

wellbeing in their individual research project, or during their own practice. In addition, two students cited that some of the techniques taught on well-being were beneficial in improving their body awareness.

Theme 5: Performing more confidently

Music performance anxiety (MPA) is closely linked with the mind-body connection theme, as well as becoming better at solving problems during music practice (as shown in quote from P5, FGD1). This is because MPA often manifests physiologically as well as psychologically, and can thus be addressed through physiological techniques (e.g., breathing exercises) or problem-solving techniques. Many students found that the methods taught for tackling performance anxiety, such as cognitive behavioural therapy (CBT) techniques and pre-performance routines, yielded positive results:

> For me, I think the biggest takeaway… which will stay with me is probably the concepts that we learned [about] performance anxiety… One of them is probably the behavioral cognitive therapies that we learned. So, for example, mental rehearsal and imagery. That will probably stay with me for a really long time. (P6, FGD1)

For the individual research project, 31% of the sample decided to implement strategies to reduce their music performance anxiety. The effects that they felt from these strategies were a reduction of anxiety symptoms, as rated by themselves and/or observed by external raters. Furthermore, students found that the quality of their performances tended to improve as a result of decreased nervousness, which further demonstrates the effectiveness of the strategies. In fact, all students remarked that they want to continue incorporating the strategies they tried, and/or build on their observed results by trying other strategies related to MPA.

Theme 6: Fostering a musician community

Lastly, the interactions facilitated by the module, such as in-class discussions and especially blog posts, helped students learn about their musician peers. Students generally found it interesting to see the variety of struggles that people face, whether similar or different from those they encounter personally. Students also learned from the ways their peers overcame the challenges they faced, especially if they face the same issues. Moreover, the blog fostered a sense of community among peers, which many found to promote important discussions that do not normally occur:

> [The blog] also helps me to be more empathetic towards my friends, cause, when I'm reading, when we are commenting on the blog posts, then I get to read their posts as well, so I found out that like, 'I'm not the only one having this problem,' so it kind of made me feel like we are all in the same boat and in the same community. So it really helped us to understand each other more, and we try to help each other as much as we can. (P6, FGD1)

Conclusion

The results of the thematic analysis applied to the post-module FGDs suggest that this module on *The Psychology of Music Performance* has significantly influenced students' practice and performance of music. This is evident in how students learned to practice more efficiently, how they became more adept at solving musical challenges through the concepts/strategies learned, and how they became more analytical while monitoring their music practice and performance. Students also understood the mind-body connection more clearly, which led them to expend more effort on their physical and mental health. Many students also reported a reduction of MPA. Finally, students benefitted from a "musician community", facilitated by the module, in which they could freely share and solicit feedback.

This range of outcomes would not be possible without the interactive teaching and learning methods employed, which allowed students to study strategies in-depth, and helped them internalize a problem-solving mindset to tackle future challenges. The findings from this study suggest that including psychology and performance science in the standard music conservatory curriculum is advantageous in order to foster problem-solving skills and analytical thinking in the future generation of musicians.

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Table 1. List of themes, their descriptions, and the total number of mentions during FGDs (with the number of unique student mentions in parentheses).

Theme	**Description**	**Number of mentions**
1. More efficient practice	Reduction of practice time through goal-setting, stopping mindless repetition, and employing specific practice strategies	11(7)
2. Better at solving problems during music practice	Exposure to a range of problem-solving strategies through application and learning to choose suitable, personalized strategies for a given problem	19(12)
3. Analytical approach to monitoring practice and performance	Increased familiarity with quantitative methods and forming a habit of analytical reflection	6(6)
4. Better understanding of the mind-body connection and the importance of health for music performance	Realizing that exercise, adequate rest and good posture have a strong positive influence on music production	9(4)
5. Performing more confidently	Finding new ways to manage performance anxiety	8(7)
6. Fostering a musician community	Sharing and learning from peers	10(10)