

STUDYING PRACTICE QUANTITATIVELY

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ABSTRACT

This paper examines relationships between practice quantity, practice quality, musicians' individual characteristics and performance quality. Twelve musicians from the Royal College of Music, London, were recruited and asked to keep weekly practice diaries for 16 weeks (recording all practice on two selected pieces). The selected pieces were then performed in weeks 16 and 17 of the study. Analyses examining relationships between practice quantity and performance quality reveal that total quantity of practice does not predict overall performance quality. Indeed, the time spent on "technical" practice in the early practice sessions negatively predicted performance quality. However, musicians who spent more time working on communicative issues (e.g. general deportment and stage presence) in practice sessions just prior to performance received higher performance quality scores. A significant, positive relationship emerged between musicians' self-ratings of practice quality (regardless of quantity) and overall quality of performance; in particular, those who engaged in higher quality "musical" practice (i.e. work on interpretative and expressive issues) in the very earliest and latest practice sessions performed better. Also, those musicians who rated themselves higher in terms of their own musical abilities (specifically, "natural ability", ability to cope with stage fright, and their efficiency of practice) performed better, suggesting that self-efficacy (broadly defined) can be an important predictor of performance quality.

1. BACKGROUND AND AIMS

Williamon and Valentine (2000) reported findings of a study that examined the relationship between the quantity of pianists' deliberate practice on a particular piece and the quality of a subsequent performance of that piece. The results showed no significantly correlated relationship, but rather, suggested that certain qualities of practice on the piece did, in fact, accurately predict performance quality.

This paper aims to extend Williamon and Valentine's research by examining practice diaries completed over a period of 16 weeks by 12 music conservatoire students. Data is explored concerning the total amount of deliberate practice on one of two pieces selected by the participants, as well as students' self-ratings of the quality of that practice. These data are compared to ratings of performance quality of the piece.

In addition, a 7-day recall questionnaire (similar to that used widely in the field of exercise science) has been developed and tested to determine whether it provides reliable data within music. It was hypothesised that such a tool would be valuable for studying the quantity (and eventually the quality) of musicians' practice.

2. METHOD

2.1 Participants

Twelve undergraduate students (four male and eight female) were recruited for the study. They were all enrolled in the 'Psychology of Performance' course at the Royal College of Music, London, and were in either their third (n=2) or fourth year (n=10) of study. They spanned a range of instruments: strings (n=5), woodwind (n=4), voice (n=2) and piano (n=1). Their mean age was 22.58 years and the mean number of years of formal training (i.e. from the first private lesson to the start of the study) was 11.67 years.

2.2 Procedure

Biographical and musical data. A number of questionnaires concerning the musicians' general and musical education and current musical activities were administered at the start of the study. In addition, the musicians were asked to rate several components of their musical ability and skill-level (e.g. overall standard of playing, "natural ability", technical proficiency, musicality, ability to cope with stage fright, efficiency of practice, and ability to memorise thoroughly and quickly) in relation to other students at music conservatoires around the world. Participants also completed the Spielberger Trait Anxiety Inventory.

Practice diaries. Practice diaries were given to the participants in the first week of the study, and they were asked to record practice on all pieces in weeks 1-2 and on the two selected pieces in weeks 3-16. The diaries elicited information on the date, piece, start and end time of each session, and the musicians were asked to estimate the percentage of time spent practicing on (1) technical, (2) musical and (3) communicative issues within each session (by circling one of the given values of 0%, 20%, 40%, 60%, 80 or 100%). Participants also gave a rating (on a 7-point scale) of overall practice quality for each piece, as well as a rating of the quality of practice on (1) technical, (2) musical

and (3) communicative issues. Finally, the students were asked to describe the goals of practice for each piece and some of the strategies used to achieve those goals.

7-day recall questionnaire. In each weekly meeting of the 'Psychology of Performance' course, students were given a 7-day recall questionnaire that elicited information on all practice carried out in total for the week (weeks 1-2) and on all practice carried out on each of the two selected pieces (weeks 3-16). This information was obtained by asking students to recall the practice done (1) before noon, (2) between 12-5pm and (3) after 5pm for each day of the week, beginning with 'yesterday', '2 days ago', '3 days ago', and so on. The participants were also asked to estimate whether the practice done within the week – relative to the previous month – was 'much less', 'less', 'about the same', 'more' or 'much more'.

Performances. Performances of the two pieces selected by each participant were given in weeks 16 and 17 of the project. Just prior to performance, participants completed the Spielberger State Anxiety Inventory. Each performance was peer assessed by students on the course using the standard assessment criteria of the Royal College of Music, London. For each performance, each peer assessor gave scores from 0-100 on (1) overall performance quality, (2) technical proficiency, (3) musical understanding and (4) communicative ability.

3. RESULTS

Data from piece 1 only are reported in this paper. The 7-day recall questionnaire has been used in analyses addressing the extent to which practice quantity and quality predict performance quality; therefore, the reliability of it as a research tool is reported first.

3.1 Reliability of the 7-day recall questionnaire

All practice on all pieces of music reported in the practice diaries was compared with all practice on all pieces reported in the 7-day recall questionnaire for weeks 1 and 2. The resulting Pearson correlation coefficient was high, $r=0.89$ ($p<0.01$), indicating that the recollection of practising activities via the questionnaire accurately reflected the practice that was actually carried out and documented in the diaries. Within the same time period, the practice recorded in the practice diary and the 7-day recall questionnaire (1) before noon, (2) between 12-5pm and (3) after 5pm was compared. The resulting coefficients were, respectively, $r=0.91$, 0.81 and 0.80 ($p<0.01$ for all). The 7-day recall questionnaire, therefore, appears to be a reasonably reliable source of information on musicians' practice and provides equally reliable data both generally and at specified points throughout a musicians' practising day.

3.2 Practice quantity and performance quality

Initial inspections into the relationship between practice quantity and performance quality revealed that the total time spent practising piece 1 was negatively related to the quality of

performance for piece 1 ($r=-0.60$, $p<0.05$). However, given that required practice time is known to differ according to instrument or the specific piece being played (Jørgensen, 1997; Lehmann & Ericsson, 1998), the total time spent practising piece 1 within each week of the study (as obtained from the practice diaries) was divided by the total time spent practising all pieces for that week (obtained from the 7-day recall questionnaire). This calculation yielded the proportion of time spent practising piece 1 of all practice done in a given week. A correlation of the mean proportion spent practising piece 1 across all 16 weeks of the study and the score for overall performance quality for piece 1 revealed that there was no significant relationship between practice quantity and performance quality ($r=-0.14$, ns).

3.3 Relative time spent practising musical, technical and communicative issues

In addition to the overall time spent practising piece 1, participants were asked to estimate the proportion of time spent practising technical, musical and communicative issues. Figure 1 displays the proportion of time spent practising each of these areas (relative to the amount of practice done per week) in Stage 1 (sessions 1-3), 2 (middle three sessions) and 3 (last three sessions) of practice, averaged across all participants.

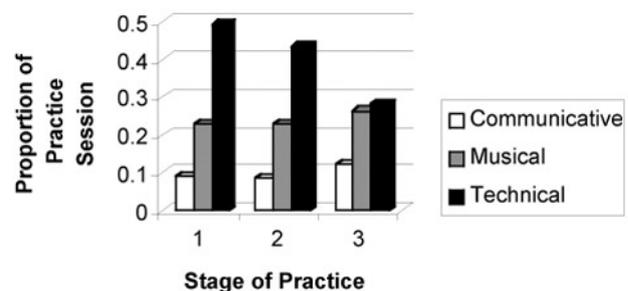


Figure 1: The time spent practising technical, musical and communicative issues in Stage 1 (the first three practice sessions), Stage 2 (the middle three practice sessions) and Stage 3 (the last three practice sessions), averaged across all participants.

A repeated measures analysis of variance (ANOVA) with type of practice (i.e. technical, musical and communicative) as the within subjects variable revealed significant differences in the amount of technical, musical and communicative practice in Stage 1 only [$F(2,22)=6.57$, $p<0.01$].

Correlations between these estimates for quantity of practice and the quality of performance revealed that participants who spent the most time practising technical issues in Stage 1 performed worse ($r=-0.60$, $p<0.05$) and that participants who spent the most time practising communicative issues in Stage 3 performed better ($r=0.64$, $p<0.05$).

3.4 Practice quality and performance quality

Ratings of practice quality, as reported in Section 3.2 above, were analysed without reference to the amount of time spent practising. Values for the quality of technical, musical and communicative practice at each Stage are given in Figure 2.

A repeated measures ANOVA with type of quality practice (i.e. technical, musical and communicative) as the within subjects variable revealed significant differences in the quality of technical, musical and communicative practice in Stage 1 [$F(2,22)=7.24, p<0.01$] and Stage 2 [$F(2,22)=8.48, p<0.01$].

Correlations between these quality ratings and the quality of performance revealed that, in Stage 1, participants who engaged in the highest quality musical practice (regardless of time) performed better ($r=0.77, p<0.01$) and that, in Stage 3, those who engaged in the highest quality musical and communicative practice performed better ($r=0.73, p<0.01$ and $r=0.63, p<0.05$, respectively).

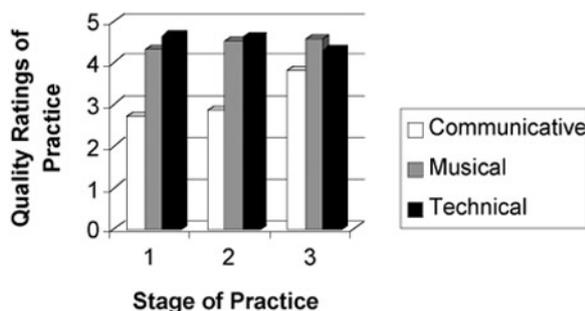


Figure 2: The quality of technical, musical and communicative practice in Stage 1, 2 and 3, averaged across all participants.

3.5 Relative quality-time spent practising musical, technical and communicative issues

The next analysis combined quality and quantity of practice. For each participant, the proportions reported above were multiplied by the rating of the quality of technical, musical and communicative practice given by the participant in each practice session. Figure 3 displays the resulting “quality-time” values for Stages 1, 2 and 3, averaged across all participants.

A repeated measures ANOVA with type of “quality-time” (i.e. technical, musical and communicative) as the within subjects variable revealed significant differences in the amount of technical, musical and communicative “quality-time” in Stage 1 [$F(2,22)=9.05, p<0.01$] and Stage 2 [$F(2,22)=6.06, p<0.01$].

Correlations between these estimates for quality-time and the quality of performance revealed that participants who spent the most high quality time practising communicative issues in Stage 3 performed better ($r=0.65, p<0.05$).

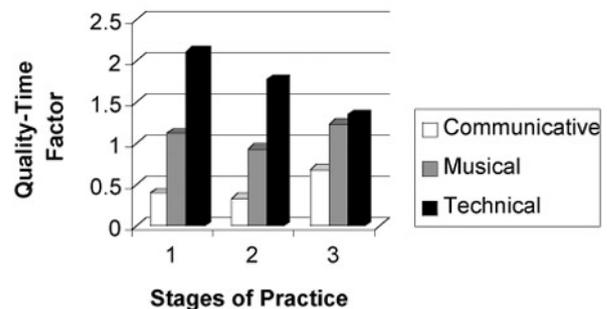


Figure 3: The “quality-time” spent practising technical, musical and communicative issues in Stage 1, 2 and 3, averaged across all participants.

3.6 Other predictors of performance quality

Analyses of the self-ratings of musical ability and performance quality revealed that those who rated themselves highest on “Natural ability” ($r=0.60, p<0.05$), “ability to cope with stage fright” ($r=0.67, p<0.05$) and the “efficiency” of their own practice ($r=0.63, p<0.05$) received higher ratings of overall performance quality. Participants who scored highest on the Spielberger Trait Anxiety Inventory received lower ratings of overall performance quality. Scores on Spielberger’s State Anxiety Inventory were not significantly related to performance quality ($r=-0.54$).

3.7 Goals and strategies for achieving goals

For each practice diary entry, participants were asked to comment on the specific goals of their practice and also to note the specific strategies that they would use to achieve those goals. In total, 839 goals were transcribed from the diaries and classified as technical, musical or communicative. The technical goals were the most frequent (75%), followed by musical goals (17%) and communicative goals (8%). In the following paragraphs, we list examples of such goals and strategies.

Examples of technical goals and strategies:

- Sub-goal: Improving stamina

Strategy: “On reflection of the first week’s diary, my stamina seems to be improving. I think I can pinpoint this to a more advanced ‘awareness’ in my practice (to use an Alexander example). I take a lie down after playing for 40 minutes, and it helps me recover breathing, posture and embouchure.”

- Sub-goal: Technical clarity

Strategy: “Today’s practice was spent on technical clarity, practising to help with the intonation. In order to listen for areas of counterpoint, each phrase or melodic line was emphasised more than it should be.”

Examples of musical goals and strategies:

- Sub-goal: To work on “musical and interpretive issues”

Strategy: “Since I now know the notes, I felt ready to listen to my CDs again – reading the piano part while listening. I also plan to look through some books to learn more about the background of the piece.”

- Sub-goal: To play through the piece “musically”

Strategy: “I used a tape recorder in this session. I listened to my playing and marked down the sections that I wasn’t satisfied with. I practised these sections carefully and then played the piece through again.”

Examples of communicative goals and strategies:

- Sub-goal: To look confident and convey musical continuity

Strategy: “I will be performing this piece tomorrow in woodwind class. I am trying to look confident and give the piece (which is quite start-stop in places) some musical continuity. I practised in front of a mirror.”

- Sub-goal: To practice the performance itself

Strategy: “Got together family and friends for a practice performance.”

These verbal data await further analysis and will likely allow interesting insights into the cognitions accompanying practice at various stages of mastery of a piece.

4. CONCLUSIONS

Previous research into accumulated life-time practice (cf. Ericsson, Krampe, & Tesch-Römer, 1993; Sloboda et al., 1996) suggested a close relation between practice and performance. The results of this study now showed that practice quantity concerning one specific piece was not as clearly related to performance quality as one might have expected. In terms of sheer quantity of practice, there was no clear relationship between total practice accrued on piece 1 and the quality of the performance of that piece. In a closer examination of practice type (i.e. technical, musical and communicative), those who spent the most time practising technical issues in the early stages of practice actually gave worse performances, which suggests that those who spent the most time tackling major technical issues in early practice sessions perhaps were not the most proficient players or were unable to focus on important musical and communicative issues. As Chaffin and Imreh (2002) point out, musical issues play a role in expert practice even early on, as they impact later technical practice. Another explanation for the emphasis on technical practice of some players could be that the pieces imposed different challenges for the players that, in turn, could have led to a more or less pronounced focus on technical issues in earlier

stages of practice. However, participants who spent more time working on communicative issues (i.e. stage presence and general deportment) in Stage 3 performed better. In this case, the practice-performance relationship mentioned earlier was confirmed.

In addition, those whose musical practice was of the highest self-reported quality (regardless of the time spent on that type of practice) in Stages 1 and 3 gave better performances. This suggests that the ability to focus one’s efforts on musical goals in early sessions and in the stages just prior to performance leads to better achievement of those goals. At the same time, these results suggest that students are aware of how well they are practising.

A number of additional personal factors, as measured in the self-ratings of musical skill, reveal significant positive relationships between self-perception and performance quality. In particular, those participants who felt themselves “naturally talented”, were able to cope with stage fright and able to engage in efficient practice performed better than others. This suggests that such self-perceptions are important for performing at one’s peak (see McCormick & McPherson, 2003, for related findings).

Further research into practice quantity, quality and a range of individual-specific characteristics are required to understand fully the best predictors of performance quality. It seems that only by explicating these important aspects of musical skill can one completely understand musical excellence.

5. REFERENCES

1. Chaffin, R., Imreh, G., & Crawford, M. (2002). *Practicing perfection: Memory and piano performance*. Mahwah NJ: Erlbaum.
2. Ericsson, K. A., Krampe, R. Th., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100, 363-406.
3. Jørgensen, H. (1997). Time for practising? Higher level music students’ use of time for instrumental practising. In H. Jørgensen & A. C. Lehmann (Eds.), *Does Practice Make Perfect? Current Theory and Research on Instrumental Music Practice* (pp. 123-139). Oslo: Norwegian State Academy of Music.
4. Lehmann, A. C., & Ericsson, K. A. (1998). Preparation of a public piano performance: The relation between practice and performance. *Musicae Scientiae*, 2, 69-94.
5. McCormick, J., & McPherson, G. E. (2003). The role of self-efficacy in a musical performance examination: An exploratory structural equation analysis. *Psychology of Music*, 31, 37-51.
6. Williamon, A. and Valentine, E. R. (2000). Quantity and quality of musical practice as predictors of performance quality. *British Journal of Psychology*, 91, 353-376.