Mental Practice for Musicians: Theory and Application

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Introduction

Musicians today must contend with a highly competitive environment where a combination of over-practice, tension, and stress is a common problem. Since these states frequently result in occupational injuries, it behooves musicians to search for more efficient modes of practice. Mental practice, a popular technique amongst athletes and the subject of extensive sports research, may provide musicians with a healthful alternative to excessive hours of physical practice.

Since the 1930's, over 100 research studies have addressed the question of whether mental practice of a skill will improve its actual, physical performance. In 1983, Feltz and Landers[1] conducted a comprehensive review of the existing literature, demonstrating that mental practice of a motor skill does in fact improve performance. (This conclusion was the result of meta-analysis, a method for statistically analyzing the findings of many individual analyses. It is "conducted on a group of studies that are related through sharing a common conceptual hypothesis or common operational definitions of independent or dependent variables. Thus, when used to examine a complete survey of studies from a specific research area, meta-analysis procedures allow a characterization of the tendencies of the research and also yield information about the magnitude of any differences between conditions."[1] p. 27) Prior to this analysis, there had been no consensus as to the effectiveness of mental practice because of conflicting data.

Feltz and Landers were particularly interested in the underlying mechanisms of mental practice, and suggested four theoretical hypotheses based on the results of the meta-analysis. The first is that, "mental practice effects are primarily associated with cognitive-symbolic rather than motor elements of the task."[1] (p. 45) The cognitive elements referred to would include remembering a sequence of events; mentally reviewing salient task elements based on instructions, observation, or an initial physical performance; predicting the outcomes of various strategies; and using imagery to aid in spatial or temporal orientation.

The second hypothesis observes that, "mental practice effects are not just limited to early learning--they are found in early and later stages of learning and may be task specific."[1] (p. 46) In the initial stage of learning a new motor skill, cognitive elements tend to be most prominent. As learning progresses, mental rehearsal of these elements becomes increasingly vivid and accurate through feedback from muscles and senses acquired during physical practice. If mental and physical practice are alternated, "task experience may aid performers in internalizing a very clear model of what a good performance of the task is like, even though they cannot yet perform it this way."[1] (p. 47)

Hypothesis III states that, "it is doubtful that mental practice effects are produced by [minimal] innervation of muscles that will be used during actual performance."[1] (p. 48) This statement refers to a psycho-neuromuscular theory which claims that imagining overt movements triggers tiny muscular responses through innervation patterns identical to the actual performed movement; and further, that these responses function as feedback, strengthening the movement's motor schema. Investigations of this theory are problematic; Feltz and Landers found that very few quantitative studies existed, and that they did not include motor performance measures as a dependent variable.

The last hypothesis asserts that mental practice can function to "assist the performer in psychologically preparing for the skill to be performed."[1] (p. 50) The imaging of task-related cues occupies the individual's attention, helping prevent distracting thoughts. The minimal amounts of muscle response accompanying mental practice helps to "prime" the muscles, facilitating their reaction time, speed, and strength. As long as anxiety is not a significant factor, this slight arousal level, combined with enhanced concentration, can assist a performer in attaining high performance levels. Further research is yet needed to support and expand this proposition.

While most of the studies covered by Feltz and Landers were interested in establishing a positive relationship between mental and physical practice, the past decade has brought a growing interest in the contrasting effects of varying types and qualities of imagery. To begin with, mental practice involves more than just visual feedback; for musicians, the inclusion of kinesthetic and auditory imagery would be an integral part of their mental rehearsal.

Naturally, the vividness and accuracy of the images will influence the effectiveness of the technique. Although individuals differ in their ability to generate mental images, this capacity may be improved through regular and persistent practice. Heightened awareness of sensory feedback is the basis for success. As an individual becomes increasingly sensitive to the totality of his or her experiences, the vivid and accurate mental depiction of these events becomes more likely. (Specific strategies for improving imagery skills lie outside the scope of this article.)

Frequent alternation between physical and mental practice can be particularly valuable; the many opportunities for physical rest help reduce fatigue, thereby lowering the chance of injury. Furthermore, regular mental reviews can become a sort of quality-control. Researchers speculate that there may be optimal times for using imagery, specific to the individual and the task; the length and number of mental practice sessions should also be considered, since the individual's capacity to concentrate will eventually decrease.

Some researchers feel that there may be times when mental practice is **not** beneficial. "Imagery rehearsal entails a conscious strategy in which the subject pays close attention to some aspect of a performance sequence. One of the important goals in most [tasks], however, is to make the motor skills run off automatically because conscious awareness can interfere with smooth performance. The concern...is that imagery rehearsal might retard this automation process when it is directed at the motor skill itself because it reinforces conscious attention to the performance sequence at the wrong time."[2] (p. 28S)

On the other hand, one could also argue that skills can become so automatic that the individual performs mindlessly, with little awareness of critical elements in the performance. Both points are valid, and reconciliation may be found in the quality and type of imagery used. Probably, the focus of imagery should change from specific cues and sequences (during early learning stages) to an overall auditory and kinesthetic "Gestalt" which captures the "flow" of the performance. Appropriately applied, imagery has the potential for re-focusing attention, restoring concentration, and revitalizing performance.

As one delves into the results of more recent research results dealing with qualitative aspects of imagery, it is important to realize that contradictory findings are typical. The body of literature is nowhere near as extensive as that available to Feltz and Landers for their meta-analysis. Furthermore, there are various ways of analyzing results, and alternative interpretations of materials are possible and legitimate. In some cases though, there are definite problems with design or methodology--the original idea might be of interest, but a remedial study would be in order. Sometimes, an hypothesis seems entirely logical and may even have extensive anecdotal support, yet experimental results do not show any significant differences between experimental and control groups.

Since the subjective component of imagery research is so significant, the accurate identification of causal factors becomes a particular difficulty. In order to help isolate these variables, several improvements in methodological strategies may be considered[3]: 1) greater variety of control groups, coupled with the use of multiple control groups within individual experiments; 2) complementing traditional group-design research with single-subject methodology; and 3) thorough monitoring of the subjects' experience, including quantity and quality of imagery, as well as thoughts and feelings.

Experiments investigating aspects of imagery which seem to have fairly direct application to the performing artist have been selected for a brief review below. The topics addressed are 1) internal versus external perspective, 2) the use of a model, 3) imagery detrimental to performance, 4) the rate of imagery, and 5) the relationship between skill level and imagery vividness. While much of this research is in its initial stages, performers can experiment on their own, using experimental evidence as the impetus for creating personal strategies.

Perspective in Mental Practice

Two perspective may be adopted during imagery: internal and external. In taking an internal perspective, the performer recalls a real-life situation, recreating the visual, auditory, and kinesthetic sensations which would be experienced in the actual situation. When using external imagery, the performer mentally puts himself in the position of an outside observer.

In studying the relationship between imagery perspective and muscular response, Hale[4] found that internal imagery produced localized activity in the muscles which would be involved in the actual movement. In contrast, the external perspective caused activity only in the eye muscles. This comes as little surprise, as the external perspective involves mental viewing of the action rather than kinesthetic empathy. The study did not evaluate whether one perspective might be more effective than the other.

Researchers Harris and Robinson[5] examined the relationship between perspective, skill level, and the relative strength of muscular response as measured by EMG electrodes. (The subjects were karate students of differing skill levels.) As expected, individuals with high levels of experience in a task would, during imagery of that task, produce more muscular response in the muscle group necessary to execute the task than someone with less experience. Also, despite instructions to the contrary, a high proportion of skilled subjects reported that they automatically switched to an internal imagery perspective. This may suggest that the better a skill is learned, the more internalized the perspective becomes.

A study of kinesthetic versus internal and external visual imagery was conducted by Mumford and Hall[6]. They were interested in the effects of these varying modes of imagery for self-contained tasks performed in a static environment (as opposed to a changeable one where visual feedback is indispensable--for example, in team sports such as basketball). Their subjects for this study were ice-skaters of varied skill. While imagery training did not enhance the performances of the various groups as compared to the control group, the more experienced performers did seem to have greater ease with kinesthetic imagery than the less experienced subjects. Mumford and Hall suggested that the more experienced athletes were better able to utilize benefits derived from mental imagery because they could internalize a more precise model, but that experimental design was inadequate to produce a significant effect.

Each of the above experiments indicates the overriding tendency for skilled performers to adopt an internal perspective, with emphasis on kinesthetic rather than visual imagery. (As mentioned previously, the musician will include auditory imagery as well.) Nevertheless, an external perspective may still be a useful tool, providing an opportunity to mentally step back from the details and see the overall picture. Concert preparations, for example, could include visualization of a perfect performance from the audience's perspective.

The Use of a Model in Mental Practice

Another way of providing objective feedback is by the use of audio and video tapes as models. A combination of watching/listening to a model, imaging the sequence in question, and performing physically provides a broadened range of feedback from which to update and enhance imagery vividness and accuracy. Each mental repetition then involves a deliberate effort to incorporate corrections gleaned from the model or physical performance.

Hall and Erffmeyer[7] conducted a study in which a filmed model was used to improve imagery proficiency. They hypothesized that the effectiveness of imagery could be increased through a systematic practice procedure. The subjects were highly skilled basketball players, divided into two groups. During a two-week period where none of the subjects practiced physically, the experimental group alternated between watching a video taped model of foul-shooting and visualizing perfect foul-shot performances. (The model was filmed from behind to help viewers imagine themselves as being the ones taking the shot. Auditory feedback, such as the bouncing ball, was included as well.) The control group simply visualized perfect performances without the aid of the video. After two weeks of daily practice, actual performance was tested. The subjects who had received the modeling treatment improved their accuracy significantly more than the control group.

For musicians, audio- and video-tapes, both of themselves and of other performers, could be beneficial. Various camera angles could be used in videotaping, depending on which facet of technique might be under inspection. If audio-tapes were being used, the listener could image the visual and kinesthetic aspects of performance that might produce the sound that they were listening to.

Imagery Immediately Prior to Performance

Another question of interest is whether certain applications of imagery can actually detract from performance. Almost every performer can empathize with the scenario of thinking "Oh-oh, here it comes...the hard part that I always screw up." And bang! They make a mistake. Researchers Woolfolk, Murphy, Gottesfeld, and Aitken[8] compared the effects of picturing a poor versus a successful task outcome immediately prior to performance. (The task involved putting a golf ball.) Their findings concur with the opinions of many teachers and performers who feel that negative thoughts will adversely affect performance. In light of these findings, the development of cognitive strategies to help block or interrupt negative images takes on added significance.

An additional dimension of their study was the comparison of 1)the effect of briefly imagining the task outcome with 2) imaging the movements that make up the task itself. Both types of imagery were used immediately prior to performance, with the result that imaging task outcome had the greater beneficial effect. In a musical performance situation, the musician would expect to have technical command of the music, and would project an aural image of the desired sound, rather than getting bogged down in innumerable details of its production.

Rate of Imagery

During mental rehearsal, the rate of the imagined movement can be manipulated to simulate a fast-forward or slow-motion film. In 1986, Andre and Means[9] examined the effects of mental practice which utilized a predominantly slow-motion rate of imagery. They hypothesized that slow-motion imagery would enrich the subject's imaginal experience, therefore enhancing the effectiveness of their mental rehearsal. For example, in learning a new skill or in reworking a technique, a slower pace ought to allow for easier identification and correction of mistakes.

Although the hypothesis seems logical, the results of this study showed no significant difference in the effectiveness of various rates of imagery. These results are not conclusive however, and if slow-motion imagery seems to work for an individual, then its use should certainly be encouraged.

The Effect of Performance on Mental Imagery

One factor, which all the previously cited studies have in common, is that they all use imagery as an independent variable and examine its effects on performance. The flip side of this would be to consider how physical performance affects imagery. Presumably, improvement in the physical performance of a skill would result in greater vividness and accuracy in its mental representation.

This issue was touched upon in a study by Bird and Wilson[10]. They measured certain physiological responses (including EEG and EMG patterns) as they correlated with mental rehearsal, and examined changes in these responses over an eight-week learning period. The subjects were eight novice music conductors and their teacher. Bird and Wilson found that the more skilled students and the experienced instructor exhibited more frequent and repeatable EEG patterns during imagery than the less skilled subjects. They also found that the instructor produced distinct EMG patterns during mental rehearsal which mirrored the actual performance. Furthermore, definite EMG patterns were beginning to appear in a few of the more skilled students. These EEG and EMG patterns indicated that learning was primarily cognitive in the novices, being followed by muscle patterning as experience increased. Bird and Wilson also suggested that the occurrence and pattern of EMG and EEG responses could serve as an evaluation of progress when mental practice skills are being learned.

Conclusion

As can be seen from the studies reviewed above, a wide range of possibilities may be pursued by the musician in the acquisition of mental practice skills. Imagery can be applied in all stages of learning, whether working on new material or reviewing and polishing for performance. A new piece or technique may be broken down into its components and rehearsed with attention moving between auditory, visual, and kinesthetic modes of feedback; generally, an internal perspective will be most appropriate.

Each physical repetition of a section can be followed by a mental one to clarify those aspects which need improvement, as well as to reinforce those which were satisfactory. If specific practice strategies are applied, slow playing for example, or exaggeration of certain features, the mental rehearsal can duplicate the physical one. As learning progresses, information becomes mentally grouped into increasingly larger units until an overall flow is achieved. Through training, the mind should be accustomed to projecting the desired sound slightly ahead of its physical production. To aid in shaping this overall concept, the use of audio- and/or video-tapes as models may be desirable.

Proficiency in imagery allows the performer to practice entirely away from the instrument as well. This may be of particular help to those recovering from injury, or during an otherwise restricted playing schedule. In conclusion, the appropriate application of imagery skills can raise the productivity of practice time, while reducing the need for excessive and potentially injurious physical practice.

References

1. Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and performance: A meta-analysis. Journal of Sport Psychology, 5, 25-57.

2. Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. Canadian Journal of Sport Science, 10, 22S-28S.

3. Wollman, N. (1986). Research on imagery and motor performance: three methodological suggestions. Journal of Sport Psychology,8, 135-137.

4. Hale, B. D. (1982). The effects of internal and external imagery on muscular and ocular concomitants. Journal of Sport Psychology, 4, 379-387.

5. Harris, D. V., & Robinson, W. J. (1986). The effects ofskill level on EMG activity during internal and external imagery. Journal of Sport Psychology, 8, 105-111.

6. Mumford, B., & Hall, C. (1985). The effects of internal and eternal imagery on performing figures in figure skating. Canadian Journal of Sport Sciences, 10, 171-177.

7. Hall, E. G., & Erffmeyer, E. S. (1983). The effect of visuo-motor behavior rehearsal with videotaped modeling on free throw accuracy of intercollegiate female basketball players. Journal of Sport Psychology, 5, 343-346.

8. Woolfolk, R., Murphy, S., Gottesfeld, D, & Aitken, D. (1985). Effects of mental rehearsal of task motor activity and mental depiction of task outcome on motor skill performance. Journal of Sport Psychology, 7, 191-197.

9. Andre, J. C., & Means, J. R. (1986). Rate of imagery in mental practice: An experimental investigation. Journal of Sport Psychology, 8, 124-128.

10. Bird, E. I., & Wilson, V. E. (1988). The effects of physical practice upon psycho physiological response during mental rehearsal of novice conductors. Journal of Mental Imagery, 12, 51-64.