

# The Effect of Singing the Melody in the Practice of the Piano.

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## ABSTRACT

The aim of this study was to test a hypothesis that if learners created more precise auditory representation from singing a melody, they could learn piano playing to reach at a higher level of performance. Seven novice piano players of varied ages learned to play novel musical pieces with and without singing their melodies. The time period of practice sessions for learning each melody with and without singing conditions was equalized. After all practice sessions, their performances were recorded to MD. The players themselves and 13 qualified piano teachers as a third party evaluated recorded music based on preciseness of performance with the given score, naturalness of the melody, and appropriateness of expression of the music. In addition, the present experimenter counted the percentages of error-free notes. The mean values of each of these variables for the singing and non-singing conditions were compared within each of the learners. It was found that four of the players attained higher scores under the singing condition than the non-singing condition whereas the others were opposite. The former group of players was found to have greater experience of daily singing than the latter group of players. Within each participant, the results of the evaluation were fairly consistent among the self-judgments, the third party's evaluations, and the percentage of error-free notes. It was concluded that the auditory representation articulated by singing could play a role in facilitating learning piano playing for the learners having familiarity with singing.

## I. INTRODUCTION

Playing a musical instrument requires both auditory and motor representation of the music in the brain of the performer. Previous studies have shown increased auditory and somatosensory areas of representation with musical practice (Pantev et al., 2001), as well as increased neural activity of the motor cortex while pianists listen to pieces that have performed before (Haueisen & Knösche, 2001). Palmer and van de Sande (1993) asked pianists to perform the same music with different melodic interpretations. The melody or primary voice is not directly marked in musical notation, and performers often interpret the voice intended as melody as more important. The voice interpreted as melody was less likely to contain errors, even when pianists changed their melodic interpretation for the same musical piece. Performers also made more errors in parts controlled by the left hand, regardless of hand dominance. Motor factors did not interact with interpretive factors (melody) in the likelihood of errors in the pianists' performance. The findings suggest that interpretive and motor factors are represented independently in memory for performance.

Effectiveness of developing an auditory model in playing a musical instrument has also been studied using mental practice paradigms. Lim and Lippman (1991) demonstrated that mental practice with listening to the auditory model provided pianists with a higher level of performance than mental practice alone. By creating with and without auditory and motor feedback conditions, Highben & Palmer (2004) examined the effect of

mental practice on piano performance. All pianists participated in the experiment were instructed to cover the absent feedbacks with mental practice. After the practice without aural feedback, the pianists who had higher aural skill played comparatively better than the pianists who had lower aural skill. This result suggested that the pianists who had high aural skill could use auditory image effectively. Koreman & Peynircioglu (2007) reported that the difference in the ability to memorize novel melodies among players depended on their preference to use visual or auditory information. Those who liked to use visual learning could memorize the melodies better by viewing the scores, whereas those who liked to use auditory learning performed the same task better with listening to the melody. Individual difference associated with the use of modality is thus an important factor of musical learning. Memorizing a target melody by singing before playing the piano, or playing the music along with singing the melody has been considered as an effective method for beginners to learn to play a novel music. Singing a melody needs a clear image on the course of notes, thus the learners can easily attain a higher level of musical performance with naturally developed auditory representation. Interestingly, none of the previous researchers has investigated this possibility.

In this study, therefore, we tested a hypothesis that in beginners of the piano, singing the melody of a novel music would facilitate learning of playing it on the piano compared to the same learning situation without singing the melody.

## II. METHODS

### A. Participants

Seven novice learners of the piano playing participated in the current experiment. All of them are females, and their ages ranged from 4 to 21 years old. Their musical experiences are as follows:

*Participant A (4 years old).* Prior to the experiment, she had 4 months of leaning the piano playing at a music school, and she could play crotchets of the white keys from C4 to F4 using one of the hands.

*Participant B (6 years old).* Prior to the experiment, she was taking private piano lessons for 6 months. She was at a level of playing musical pieces using the bilateral hands without shifting the position of the fingers.

*Participant C (8 years old).* She had one-year experience of a private piano lesson from 4 years of age, and 3 years of music school lesson from five years of age. She was able to play easy musical pieces with occasional jumps and shifting of the finger position in the bilateral hands.

*Participant D (9 years old).* She learned to play the electronic organ from 4 to 5 years of age, and from 6 years of age, she was playing the piano. Because she was not good at reading the scores, she played the music by the ears at the

beginning. She then took a novel score reading lesson from 7 years of age. By reading a score of novel musical pieces which included easy scales and some notes with accidental notations, she was able to play those.

*Participant E (21 years old).* She was an infantile education-major student at the university. She took two-years of private piano lessons to learn to play the musical pieces in a basic text book, some easy classical pieces, and children's songs from the age of 18 years. She also practiced sight-playing on the piano and singing a song while playing the piano for six months.

*Participant F (21 years old).* She was an infantile education-major student at the university. She took six-years piano private lessons from 6 to 12 years of age during which she learned to play the musical pieces from a basic text book and easy classics. She also took a private lesson from 20 years of age to learn to play musical pieces for the beginner-to-middle's class learners of the piano, and some pieces commonly used for child-care.

*Participant G (21 years old).* She was an infantile education-major student at the university, and she was practicing singing children's songs while playing the piano. She took private piano lessons from 6 to 13 years of age, and learned to play musical pieces in a basic text book, easy classical pieces, and some popular songs arranged for piano solo. She belonged to a classical-guitar club at the high school, and at the university, she was a member of a choral society for one year. She also was an amateur solo vocalist of rhythm and blues band since she was a high school student.

## B. Experimental tasks

Each participant practiced an even-number (4 to 12) of musical pieces which shared following characteristics: unknown for the participant, having a clear melody, and requiring within 20 minutes of practice to be able to play it fairly smoothly. These pieces were selected from textbooks and anthologies for the beginners' level of piano players. Two sets of a pair of musical piece that have same level of difficulty in terms of their note and rhythm arrangements, and their tonality were used for each participant to play during the experiment. The level of difficulty in playing these pieces was determined based on the priori-checked level of piano skill for each participant. The musical pieces for the participant A to play were composed by the present investigator using the white key's crotchets from C4 to G4 and crotchet rests. Each participant therefore learned to play multiples of four different pieces of music. These were presented to each participant in two separate-day practice sessions. The order effect of the experimental conditions was minimized in such a way that the paired musical pieces in each of the two sets were separated firstly, and two sets of newly paired musical pieces were formed secondly. These new pairs were randomly assigned to either of the first-day or second-day practice session. The order of the experimental conditions in each practice session was always the singing condition first, and the non-singing condition second. By assigning these order to the two-day practice sessions, and arranging the order of musical piece to be performed in each day, the order effect was counterbalanced within the original pair of music.

## C. Procedures

The participants were handed the score of the musical piece to be played one at a time, and practiced it for the same designated time period without listening the model playing. The practice period varied from 10 to 20 minutes for each participant by taking the ability of concentration based on their age, and the length of the pieces in account. During the practice sessions, the investigator was sitting by the participant, and basically observing the participant without any command. Only when following conditions were met, the investigator interrupted the practice and gave a command.

- The participant practiced without singing for the singing condition. (The participant was asked to sing with playing the piano.)
- The participant practiced with singing for the no-singing condition. (The participant was asked to practice without singing.)
- The participant asked a question about reading of the given score. (The investigator gave the participant an appropriate answer to it.)
- The participant played wrong notes more than once. (The investigator informed the participant about wrong notes being played.)
- For the singing condition, the participant was unable to vocalize the very first note. (The investigator presented the vocalized very first note for the participant.)

## D. Evaluations

1) *The Self-Judgment.* After each practice session for each piece, its performance was recorded to MD. When the practices session and recordings were completed, the participant listened to the recorded performance of her own, and she was asked to evaluate the performance by responding to each of the following four questions using a five-point scale (5: very good, 4: good, 3: neural, 2: poor, and 1: very poor).

- Question 1: Did I play the piece accurately without hesitation?
- Question 2: Did I play the piece smoothly at a stable tempo?
- Question 3: Did I play the piece as intended?
- Question 4: Am I satisfied with my recorded performance?

2) *The Third Party'S Evaluation.* Thirteen piano teachers who commonly teach novice players served as a third party to judge better performance between the two recorded music for each pair for each participant. Following three questions were answered by each judge. One point was given to the better performance, 0.5 point for equivalent performance.

- Question 1: Which piece did the participant correctly followed the score?
- Question 2: Which piece did the participant played the melody more naturally?
- Question 3: Which piece did the participant play in more appropriate expression?

3) *The Error-Free Notes Counted by the Investigator.* Error-free notes for each of the recorded musical pieces were counted by the present investigator, and it was expressed by the percentage of the whole notes played. In addition, the number of meters longer than half and shorter than twice of the average

length of the meters was counted, and it was also expressed by the percentage of all numbers of the meters in the piece.

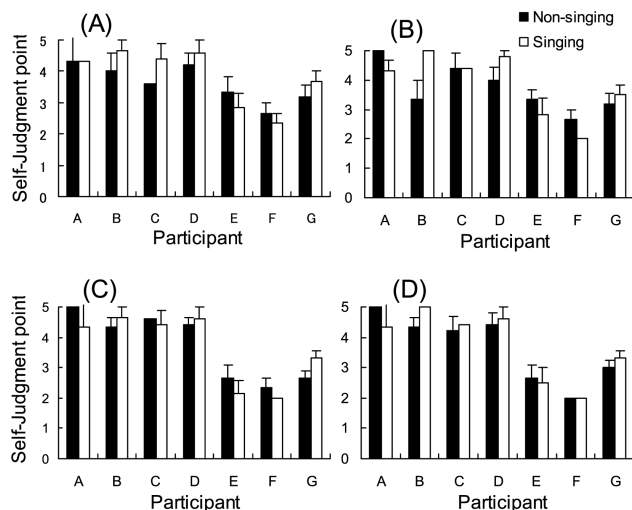
### III. RESULTS

The singing and non-singing conditions were compared using the means of the self-judgment values, the third party's evaluation, and the percentage of error-free notes. Statistical tests were not applied because the number of participants was small, and their ages, musical experience as well as the number of the musical pieces played varied among the participants.

#### 1) The Self-Judgment

The mean values of the 5-point self-evaluation for each participant are shown in Figure 1. Standard errors are also shown as a guide.

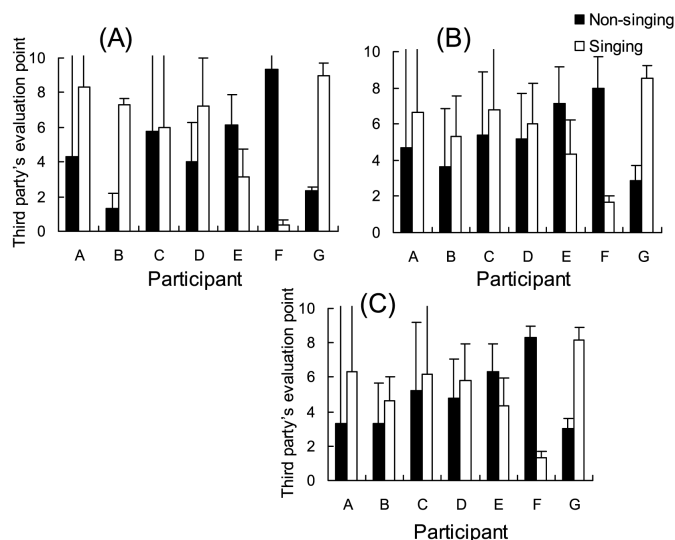
Note that the difference between the two means was relatively small in each participant. However, in response to all questions, participants B, D, and G evaluated performance of the singing condition better than the non-singing condition, whereas participants A, E, and F evaluated performance of the non-singing condition better. Participant C did not show a consistent response to the three questions.



**Figure 1.** The self-judgment of performance assessed in a five-point scale (the mean and standard error) for each participant for the singing and non-singing conditions. Responses to Question 1: accuracy of performance (A), 2: smoothness of tempo (B), the level of intension-actual performance matching (C), and overall goodness (D).

#### 2) The Third Party's Evaluation

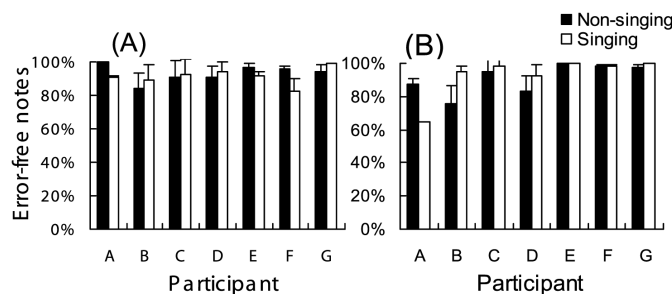
The results of the third party's evaluation are shown in Figure 2. Participants A, B, C, D, and G evaluated the singing condition better in performance in all three questions. This trend was most evident in question 3 (expressiveness of the performance) for the participants B and G. By contrast, participants E and F had a higher mean value for the non-singing condition in all questions asked. The third party's evaluation of better performance in all questions was therefore fairly consistent for each participant.



**Figure 2.** The third party's evaluation points (the mean and standard error) for each participant for the singing and non-singing conditions. Responses to Questions 1: accuracy of performance relative to the score (A), 2: naturalness of the melody (B), and 3: appropriateness of expression (C).

#### 3) Performance Evaluation by the Present Experimenter

The mean percentages and their standard errors of the error-free notes for each participant-condition are shown on Figure 3. Participants B, C, D and G had a little higher percentage of error-free notes as well as meter length for the singing condition than the non-singing condition. Participants A, E and F had a higher mean number of error-free notes for the non-singing condition in the number. Participant A also had higher mean value of error-free meter length for the non-singing condition, whereas Participants E and F had a similar mean value of error-free meter length between the singing and non-singing conditions.



**Figure 3.** The percentages (mean and standard error) of the error-free notes in the choices of the keys (A), and of the number of meters longer than half and shorter than twice of the average length of the meters (B).

### IV. DISCUSSION

As mentioned in the introduction, by creating auditory representation of a melody being played on the piano through simultaneous singing, novice learners were expected to play the target music more smoothly and accurately than without creating such representation. On the other hand, there was an

opposite possibility that learning to play the target music on the piano might be less facilitated by singing than by not singing because of motor-auditory interference. We found that among the seven participants, four of them (B, C, D and G) acquired higher scores of performance for the singing condition compared to the non-singing condition, supporting the former conjecture. From the perspectives of musical experience, participants C and D were students of piano and singing at local musical schools for over 4 years. Participant G was an active vocalist of an amateur rhythm and blues band. Participant B, a 6 years old girl, commonly practiced singing at the kindergarten. All of these participants were therefore familiar with singing, which might be the major reason for the facilitation of learning to play a given music on the piano. These participants might also have been more motivated in piano practice with singing because it could give them joy compared to that without singing. A stronger motivation thus might also have played a role in their facilitated piano learning.

Participants E and F were less well in piano performance after practicing with singing than without singing. It is therefore possible to postulate that auditory-motor interference occurred in these participants. Unlike the other participants, these two participants reported that they were unfamiliar with singing, and also reported that learning how to play with singing was more difficult than without singing. These results suggest that for those who are less familiar with singing, singing with playing the piano can cause the interfering effect on creating motor representation of the music. The interference might also be caused by the willingness to practice with singing. The individual difference in the effect of learning method for playing the piano has also been reported in the studies by Highben & Palmer (2007) and Koreman & Peynircioglu (2004). In the present study, the practice sessions were limited to less than 20 minutes and the numbers of practice sessions were from 6 to 12 times. If the training sessions were extended longer, these two participants may become more familiar with singing, and may show better effect of the singing condition than the non-singing condition. The effect of inter-learner variation needs to be examined in the future study.

The present effects on learning of playing the piano with singing were basically consistent in all aspects of performance evaluation. This was not only in natural phrasing and better expression of the played music, but also in the aspects of accuracy in performance and easiness of playing. These results were fairly consistent among all evaluators. We therefore believe that in learners can show the positive effect of simultaneous singing, the formation of auditory representation through singing can contribute to provide multiple aspects of musical learning.

The limitation of the present study was that no statistical test was performed. Causal association between auditory (aural) representation and the acquisition of piano playing skill can be strongly stated. This should be verified in future experimental study with larger number of participants.

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