

# **CORRELATION BETWEEN PIANO PERFORMANCE ABILITY WITH RESPECT TO BIOMECHANICAL SKILLS AND THE AGE OF FIRST INSTRUCTION ON THE INSTRUMENT**

**Minni Ang, Soh Li Ping & Kho Tze Ming**

Music Department  
Faculty of Human Ecology  
Universiti Putra Malaysia  
43400 UPM Serdang  
tel. 03-89486101 ext 1738  
fax. 03-86561689  
[minni@music.upm.edu.my](mailto:minni@music.upm.edu.my)

## **ABSTRACT**

95 respondents from among Music Department students, including students minoring in music, as well as lecturers, all of whom have had formal training in playing the piano, participated in this study. Data was gathered through the use of an acoustic piano equipped with MIDI sensor devices. Participants were required to play a set of scales, ranging from 5 finger exercises to two octave scales. Duration and velocity data were analysed with the intention of studying the evenness of pianistic touch, with the assumption that the better the finger control, the more even the playing. Respondents were also required to fill in a survey questionnaire with regards to their piano learning history. Respondents results were then grouped according to 4 age-group categories: those who started learning the piano before the age of 6, those who started between 7 to 9 years old, 10 to 15 and after 16 years of age. Research findings indicate that candidates who begin piano lessons at the age of 6 and below are best able to achieve rhythmic accuracy in their playing, and for those who start later than 15, rhythmic accuracy is extremely difficult to achieve. Research findings also indicate that candidates who begin later than 15 have significantly weaker finger strengths compared with those who begin earlier, although consistency in finger strength is still achievable within these limitations if candidates regularly practise specific finger exercises.

## **1.0 Introduction**

MIDI technology is a useful means of quantitatively studying pianists' skill levels. Research needs to be conducted to determine if there is a relationship between pianists' achievement levels and their age of first instruction on the instrument. Intuitively, it may seem reasonable to assume that the younger one starts to learn the instrument, the easier it is for one to develop his or her skills. However, no scientific proof of this has yet been obtained. Given the current state of events in Malaysia, where musical instrument study is being encouraged and careers in music are gaining the acceptance of the public, it is important to ascertain the optimum age to begin learning an instrument in order to achieve world class performance standards. Also, if it can be shown that after a certain age musical instrument performance potentials are lessened, time and money need not be wasted on trying to develop such world class skills in those past this age limit [they can still learn to play an instrument out of their own interest or as a hobby, but not with the aim of becoming a professional musician]. Effort can instead be focused upon those young enough to be able to benefit from such training.

## **2.0 Literature Review**

Research has shown that musical instrument study bring much benefit to the individual in terms of physical, intellectual and emotional development [1,2]. The Malaysian government is currently encouraging the growth of art music as a reflection of high culture, in line with Vision 2020. This encouragement is seen in various current development such as: music education is beginning to be introduced at all levels of school, including both primary and secondary school level; many new orchestras have been set up all over Malaysia; and, more music programs have been opened at local public universities as well as at private twinning colleges [3]. To achieve a high level of musical performance skill, musical instrument study must commence during childhood and continue throughout life. This is because playing an instrument is a skill that involves fine motor control that requires training from a young age.

The use of computer technology, specifically MIDI (Musical Instrument Digital Interface) technology, to conduct biomechanical research is apt as it is able to produce quantitative data in a scientific environment, with sufficient reliable detail to support the study of musical performance phenomena [4]. For example, a model of "pianistic touch" has been developed as a study on the expressive component of piano playing, using an electronic piano equipped with a MIDI interface to a computer [5], where variables such as piano key velocities and note durations were measured using MIDI technology. Other research using MIDI technology involved the quantitative analysis of tempo and rhythm by two different pianists, as a measure of quantifying the musician's skill levels [6].

## **3.0 Methodology**

The sample respondents consisted of students enrolled on the Bachelor of Music degree program and those taking Music as a Minor package from the Music Department at the Faculty of Human Ecology, University Putra Malaysia, totalling 95 individuals, all of whom had previously undertaken formal piano studies. Respondents were divided into four groups, according to their age of first instruction on the piano. Group 1 consisted of those who began piano lessons from the age of 6 and below, Group 2 started between the ages of 7 to 9 years old, Group 3 between 10 to 15 and Group 4 at 16 years of age or later.

Each candidate was required to play set music note patterns based on a particular scale, on the acoustic-MIDI piano, a regular piano equipped with MIDI sensors for the purpose of recording MIDI data. MIDI software installed on a Pentium

MMX-200 MHz computer connected to this piano was used to accurately record pianistic touch data. This data was then analysed from the perspective of rhythmic evenness and the loudness of each note played. Timing and velocity data were analysed with the aim of studying uniformity of piano touch. The assumption here was that the more skilled player would have better finger control, and that the data would show that such a player should be able to play the set finger patterns more evenly than a less skilled player. The respondents were also required to answer a survey questionnaire which aimed to glean background information on the piano learning history of each individual.

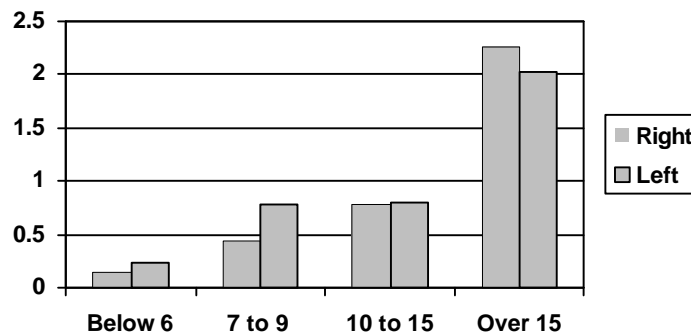
#### 4.0 Results and Discussion

Two types of data were measured, related to two types of skills required to play the piano: timing data which is related to rhythmic accuracy, and MIDI velocity data which is related to finger control and finger strength. Secondary factors were taken into account through the survey questionnaire: this included current age, hours of daily practise and frequency of practise, and whether or not the candidates practised exercises designed specifically to build finger technique. The data thus gathered was then categorised according to the 4 Groups, as in Table 1 below.

**Table 1. Groups according to Age of First Instruction on the Piano.**

Category	Number of respondents
Below 6 years old	23
7 to 9 years old	28
10 to 15 years old	31
16 years old and later	13

With respect to rhythmic evenness, it was found that the deviation for the right hand readings were most different from the metronome tempo for Group 4, and smallest for Group 1. Group 1 achieved a deviation of only 0.25% compared with 3.77% achieved by Group 4. Data for the left hand showed similar trends, with Group 1 achieving a deviation of 0.38% and Group 4 achieving 3.37% (Figure 1). This finding indicates that those who started piano lessons at the age of 6 and below were better able to achieve rhythmic accuracy, while those who started learning the piano after the age of 15 found it very difficult to keep their tempo even. This was true even when secondary factors were taken into consideration: the data showed that 70% of the candidates in Group 4 regularly practised compared with only 48% of Group 1 candidates.



**Figure 1. Rhythmic Deviation compared with Metronome Tempo.**

With respect to finger control and finger strength, the data collected was less distinctive between the groups. The clear difference was in the definition of the term "loud" as understood by the different groups. For the right hand, Groups 1,2 and 3 all obtained readings within a range of 1.15 points of each other, while Group 4 produced readings which were less on average by 9.54 points compared with the other three groups. For the left hand, a similar trend was shown, with Groups 1,2 and 3 recording average readings differing by only 0.49 points, while Group 4 was less by 5.71 points compared with the average of the three other groups. This meant that on the whole Group 4 candidates were not able to play as loudly as those from the other groups. (Figure 2).

Despite this, the standard deviations achieved by each group as compared with the group's own average velocity reading varied by only 0.116 points for the right hand and 0.133 points for the left hand, an insignificant deviation. The conclusion that can be drawn here is that "old" candidates were not able to achieve as great a finger strength as "younger" ones, but consistency was achievable within the limits of each one's capacity – implying that in this case, frequent practise did make a difference – frequent practise by 70% of Group 4 candidates compared with less than 50% for each of the other groups. (Figure 3).

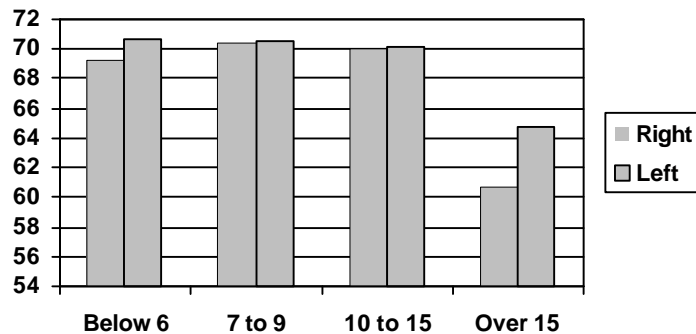


Figure 2. *Velocity* Data Readings, indicating Loudness / Finger Strength.

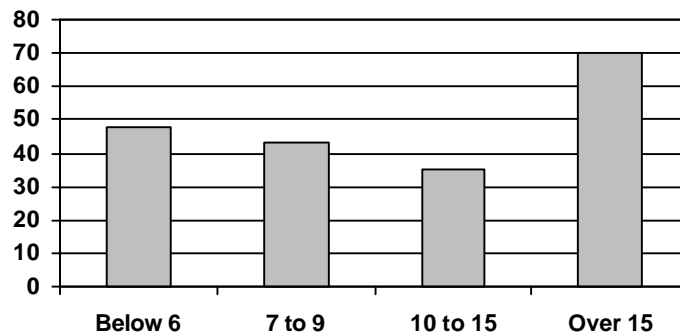


Figure 3. Percentage of Respondents that practised Regularly and Frequently..

### 5.0 Conclusions and Suggestions for Further Study

In conclusion, the research findings indicate that candidates who begin piano lessons before the age of 7 are able to achieve higher levels of biomechanical skills compared with other candidates, and candidates who start later than 15 have a significantly lower achievement level compared with others. This implies that if an individual has ambitions to achieve very high levels of skills in piano playing, piano study must begin before the age of 7.

Further research needs to be conducted on a long term basis to trace the development and progress of pianistic skills under various conditions, and more in-depth study needs to be carried out on secondary factors affecting pianistic achievements.

### Acknowledgement

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#### **ABOUT THE AUTHORS**

Minni Ang received her B.Sc.Hons. in Physics from Universiti Malaya, her GBSM in Percussion Performance from Birmingham Conservatoire, and her Ph.D. in Computer Applications in Music from Universiti Putra Malaysia. She is currently the Head of the Music Department at UPM. Her current research interests include music synthesis technology and musical instrument acoustics. She is a member of the Audio Engineering Society, the Acoustical Society of America, the American Institute of Physics, and the International Computer Music Association.

Soh Li Ping and Kho Tze Ming both received their B.Mus.Hons. in Music Technology from Universiti Putra Malaysia in 1999