Analyzing the Influence of Key Touch on Display of Timbre in Piano Playing Based on AMOS Model

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Abstract

Improvement of people's culture and their self-awareness gradually increase their requirements for emotional resonance and spiritual demand of timbre in piano playing. Moreover, key touch in piano playing has a great influence on timbre, and changes in the power and speed of touching keys and angle of keyboard can also change timbre in piano playing to some extent. Therefore, according to predecessors' foundations of theoretical research, this paper conducts questionnaire survey and data reduction for relevant personnel in piano playing field and analysis for data collected, which practically researches specific influence path of key touch on display of timbre in piano playing. Research indicates that in piano display, changes in player's power, position and speed of touching keys, and angle of keyboard all directly influence display of timbre, and power and speed of touching keys significantly influence display of timbre, and angle of keyboard and position of touching keys have a small impact on display of timbre, all of which means that during the future piano playing, player should reasonably control power and speed of touching keys to appropriately display timber during the playing according to artistic characteristics, emotional tone or others of repertoire.

Key words: Piano Playing, Key Touch, Display of Timbre, Research on Influence.

1. RESEARCH BACKGROUND

1.1 Literature review

In recent years, lots of excellent piano repertoires, brought by internet popularization, have enriched people’s spiritual and cultural life. With increase of people’s aesthetic consciousness and thoughts and emotions, domestic scholars have begun to strengthen focus on display of timbre in piano playing and formed lots of documentation. Qin Qin et al. mainly conducted a research including contents such as influence on piano timbre caused by timbre change mechanism, different ways of touching keys or others in piano playing, and pianist's different requirements for timbre in different historical periods (Qin and Chen, 2007). Cao Jing thinks that according to specific needs of music piece, timbre can be determined and the most important methods in timbre control are techniques of key touching and soft pedal stepping, whose combination and change generate ever-changing piano timbre (Cao, 2011). Fan Rong et al. thinks that piano playing is featured by strong technique and key touch principles and techniques will directly influence piano tone, timbre, playing effects and music performance depth. Therefore, from the perspective of key touch, they discussed key touch elements for piano timbre (Fan et al., 2015). In order to demonstrate importance of key touch to display of timbre in piano playing, Ma Yu parsed influence on timbre in aspects of dexterity and power of fingers touching key and fingertip by starting from tone cognition and identification (Ma, 2015). Through researching influence on timbre by key touch technique, Li Tao et al. find that different timbre can be changed relying on player’s correct control for the power and speed of touching keys so as to better interpret and understand music (Li and Li, 2015). According to research on relation between key touch and timbre in piano playing, Sun Ying et al. find that the power and speed of touching keys and angle of keyboard can directly influence emotional expression and artistic style of timbre (Sun and Cai, 2016).

1.2 Research purpose

Tone, features of music, includes its pitch, emotional expression or others. In addition to involving value in music field, tone in piano playing includes fields of aesthetic appreciation and culture, such as humanity factors of aesthetic ideal and value as well as times, region, race, belief and morality. Cognition and identification of tone in piano playing indicate that other parts of body touching key and key touch technique have a certain influence.
on display of timbre(Zhang,2015). However, since that research of influence on display of timbre by key touch in piano playing has been made by scholars at home and abroad without practical verification and data analysis and is mostly theoretical, such research lacks certain scientific nature and persuasion (Lu,2016). To this end, on account of predecessors’ research foundation, this paper conducts questionnaire survey for relevant personnel in piano playing field and then sorting and analysis for data collected, which practically discusses specific path of influence on display of timbre by key touch in piano playing. According to the research, in piano display, key touch significantly influences display of timbre, and the power and speed of touching keys and angle of keyboard all directly influence display of timbre, in which the first two have a great effect and the angle of keyboard and position of touching keys have a small impact. We hope to supplement document literature in relevant fields through the research so as to further provide science-based and targeted guidance on future piano-playing teaching.

2. THEORY OF INFLUENCE ON TIMBRE BY KEY TOUCH IN PIANO PLAYING

As is well-known, change of key touch in piano playing will have a certain effect on display of repertoire timbre. Specifically speaking, specific path of influence by key touch can be divided into the following categories:

Firstly, influence on display of timbre by the power of touching keys in piano playing. Generally speaking, there is a direct relationship between rise and fall of sound by touching key and the power of touching keys. In piano playing, player adjusts power of touching key mainly through arm weight and power of playing. Player can properly control power of touching keys and then influence effects of display of timbre in piano playing through effectively adjusting arm weight and power of playing, which mainly relies on position of wrist or elbow. If player is too nervous and flurried, flexibility of his/her wrist or elbow will be affected, finally affecting power of touching keys and then failing to perfectly produce ups and downs effects of repertoire tone in piano playing. Therefore, player should, before piano playing, relax himself/herself, ensure that his/her arms are at comfortable state, and make all power concentrated in fingertips to coordinate with other positions of limbs so as to complete tone control (Yu,2015).

Secondly, influence on display of timbre by speed of touching keys in piano playing. Speed of touching key refers to speed that player touches the key and can indicate times of touching keys within a period of time. The more times mean faster key touching, correspondingly changing effects on display of timbre. In addition, speed of touching key and frequency greatly influence purity in display of repertoire timbre. Key touching is faster, representing shorter, crisper and rapider timbre; key touching is slower, representing smoothing repertoire in piano playing and longer, more moderate and more tactful timbre due to reduction of overall timbre continuity. All this means that player should control speed of touching keys according to his/her own situation and emotional keynote of repertoire so as to ensure the best display of timbre.

Thirdly, influence on display of timbre by the angle of keyboard. At present, influence on display of timbre by the angle of keyboard in piano playing can be divided into two types: the first one is to make the angle of keyboard smaller and height shorter as far as possible so as to make fingers closer to key and obtain more beautiful and complete melody; the second one is to make the angle of keyboard larger and height longer so that player quickly masters melody of repertoire and play it in a crisp and short manner to make timbre more clear and lively. During specific piano playing, player can reasonably control the angle of keyboard according to emotional tone and appeal of repertoire. During daily piano training, player should, through combining effectively two practice methods, conduct balanced practice to properly control and adjust the angle of keyboard and improve effects on display of timbre.

Fourthly, influence on display of timbre by position of touching keys. As for method of touching key in piano playing, player should not only pay attention to the whole process of touching keys, but also concern position of body falling on keys, namely, important position that pianist’s body (including palm, wrist, arms, etc.) contacts keys. Position that parts of pianist’s body contacts keys will always display of repertoire timbre. During playing, when touching key, player should make his/her palm relax and fingers separated with each other downwards and independently so as to ensure to realize the maximum speed of touching keys and the widest touching range under “quick touch” order or realize that sound produces closely following key touching and fingers can be put on keyboard without being stressed during “relax” training. During piano playing, pianist adjusts direction of wrist towards parts such as palms and fingers and makes wrist coordinate with arm force-applying position, which can ensure display of repertoire timbre is more natural and coherent and indicate effects on display of moderate, radical, soft and hazy timbre (Su, 2014).
3. EMPIRICAL ANALYSIS

3.1 Condition hypothesis and model

According to above analysis, four hypothetical conditions put forward for influence on key touch in piano playing are as follows:

Hypothesis 1: Power of touching keys has a direct impact on display of timbre in piano playing.

Hypothesis 2: Speed of touching keys has a direct impact on display of timbre in piano playing.

Hypothesis 3: Angle of keyboard has a direct impact on display of timbre in piano playing.

Hypothesis 4: Position of touching keys has a direct impact on display of timbre in piano playing.

Based on above conditions, hypothesis model of influence on display of timbre by key touch is built as shown in Figure 1. The model is provided with four independent variables in total including the power of touching keys, the speed of touching keys, the angle of the keyboard and position of touching keys and a dependent variable, namely, timbre expression.

![Figure 1. Hypothesis Model](image)

3.2 Data resource

During the period from July to September in 2015, in this research, through investigation methods of combining paper and electronic questionnaire, 100 pieces of paper questionnaire were issued to piano players in Shanghai, Shenzhen, Beijing and Guangzhou, such as pianist, piano teacher and students learning piano for many years, and 400 copies of e-questionnaire were provided in network communication group, micro-blog and forum for piano playing. 500 copies of paper and electronic questionnaire in total were issued, among which 465 copies were received, including 417 copies of valid questionnaire with effective recovery of 83.4%. Among all personnel investigated, persons above 30 years old account for 27.6%, those under 30 years old account for 72.4%, persons with monthly income of less than RMB 10000 yuan account for 12.6%, those with monthly income of RMB 10000-30000 yuan account for 59.3%, those with monthly income of more than RMB 30000 yuan account for 28.1%.

3.3 Empirical testing

In order to test whether data of questionnaire collected are reliable, we need to test reliability and validity of hypothesis model-related variables data disposed. Firstly, we use Cronbach’s α reliability test method to test reliability of variables data and obtain α values of variables based on formula $\alpha = \frac{k}{k-1} (1 - \frac{\sum \sigma_i^2}{\sigma^2})$. Then, by CFA method, we extract variance of mean of variables to test their validity, and variance of mean can be obtained based on formula $\text{AVE} = \frac{\sum \lambda^2}{\sum \lambda^2 + \sum \varepsilon^2}$. According to reliability and validity test results, a value of each variable of key touch in piano playing is more than 0.6 (in general case, threshold value is 0.6) and total reliability of variables is 0.91, which indicates that questionnaire data information collected has great reliability and item
measurement is really reliable. Besides, AVE value of each variable is more than 0.7, meaning that data of variables have good convergent validity and further analysis can be conducted.

Then, by factor analysis, we use Amos22.0 software to verify matching between variables and samples data, namely, degree of fitting between them. Fit index of each variable obtained after calculation is less than reference standard value of 0.08, and NNFI, CFI and IFI values are more than standard value of 0.9, indicating that hypothesis model is in good fitting condition, variables match with sample data well and further test can be conducted.

Furthermore, by multiple linear regression analysis, we test and verify above hypothesis conditions and models. With taking display of timbre as dependent variable in piano playing, we establish the following regression model:

$$YS = \alpha + \beta_1 \text{CJLD} + \beta_2 \text{CJSD} + \beta_3 \text{CJJD} + \beta_4 \text{CJWZ} + e$$  \hspace{1cm} (1)$$

Where, YS is display of timbre in piano playing, \( \alpha \) is intercept; CJLD, CJSD, CJJD and CJWZ represent the power and speed of touching keys, the angle of the keyboard and position of touching keys respectively; standardized regression coefficients of index variables are \( \beta_1, \beta_2, \beta_3 \) and \( \beta_4 \) respectively; \( e \) is stochastic error term.

Through substituting sample data into above formula, we obtain regression analysis results of influence on display of timbre by 4 key-touching factors in piano playing, and these results are as shown in the following table 1.

<table>
<thead>
<tr>
<th>Relation between variables</th>
<th>Standardized coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Multicollinearity statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>CJLD ( \rightarrow ) YS</td>
<td>0.187</td>
<td>0.198</td>
<td>0.000***</td>
<td>0.963</td>
</tr>
<tr>
<td>CJSD ( \rightarrow ) YS</td>
<td>0.175</td>
<td>0.278</td>
<td>0.009**</td>
<td>0.922</td>
</tr>
<tr>
<td>CJJD ( \rightarrow ) YS</td>
<td>0.098</td>
<td>0.157</td>
<td>0.078*</td>
<td>0.866</td>
</tr>
<tr>
<td>CJWZ ( \rightarrow ) YS</td>
<td>0.094</td>
<td>0.254</td>
<td>0.024*</td>
<td>0.831</td>
</tr>
</tbody>
</table>

(Note: *: be distinct under 0.05, **: be distinct under 0.01, ***: be distinct under 0.001)

According to table 1, firstly, standardized coefficients of CJLD \( \rightarrow \) YS and CJSD \( \rightarrow \) YS are more than 1, indicating the power and speed of touching keys have a great impact on display of timbre in piano playing and such impact is distinct under 0.01; secondly, standardized coefficients of CJJD \( \rightarrow \) YS and CJWZ \( \rightarrow \) YS are 0.098 and 0.094 respectively, indicating that the angle of keyboard and position of touching keys have a certain influence and such influence is quite small.

**4. CONCLUSION**

In conclusion, during piano playing, key touch has a direct influence on display of timbre, and its influence path is mainly divided into three categories, such as influences on display of timbre respectively by the power of touching keys, the speed of touching keys and the angle of keyboard. Among these paths, changes in the power and speed of touching keys can make display of repertoire timbre distinctly changed in piano playing, and changes in the angle of keyboard and the position of touching keys can also have a certain influence on display of timbre. All this indicates that in order to have a good control for display of repertoire timbre and correctly express emotional tone and feeling in piano playing, piano player must reasonably control his/her own power and speed of touching keys, and meanwhile, must pay attention to angle of touching keys (Gao Huaman, 2015). Therefore, player should, during daily piano playing training, focus on power and speed of touching keys, position of touching keys and angle of keyboard, master skills for properly controlling key touch technique through long-time training, so as to improve his/her own piano playing level and ability.

**ACKNOWLEDGMENTS**

REFERENCES