

The “Four Main Factors Theory” of Piano Teaching and its Systematic Thinking

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Abstract—What are the main factors required in the process of piano playing and how to cultivate the abilities corresponding to these main factors have been discussed for a long time in piano education. By using the theories of systematic thinking, psychology and pedagogy, this paper proposes that the main factors in piano playing are not only vision, hearing and touch, but also "consciousness", and wherefore puts forward the theory of "four main factors" in piano teaching, to realize the coordination of eyes, ears, hands and brain, and give full play to the overall function of piano teaching system. At the same time, combined with the thought of system engineering, this paper discusses the application of the "four main factors theory" in piano teaching. It is hoped that piano teaching can be provided with theories and methods with practical application values through the combination of interdisciplinary and new perspectives.

Keywords—Piano teaching; Systematic thinking; Main factors; Vision; Hearing; Touch; Consciousness

I. INTRODUCTION

A new scientific research trend of horizontal interdisciplinary is appeared in the 1940s. It is pushing the cross-cutting, marginalization and comprehensive research of modern science to a new peak. The systematic science advocated by a famous scientist Qian Xuesen in China is one of the most important emerging disciplines. System science is to look at the entire objective world from the perspective of the system. It deals with both natural and social problems^[1]. System science takes the system as the research object, focusing on the common relationships and attributes of various systems, revealing its changing laws, and exploring various theories and methods of the system. System engineering, system theory, and system thinking all belong to the category of system science. Systematic science has made up for the shortcomings of traditional methods, and its application and influence have spread throughout all disciplines.

This paper combines this new interdisciplinary perspective into the theory of piano performance and teaching to help to get rid of the inertia of thinking and research. Additionally, it uses system thinking to explore practical problems in piano teaching. It is hoped that the understanding of piano playing and the analysis of piano teaching can change from single layer to multi-layer, from partial to integral, from individuality to relevance. To achieve the change of cognition and method innovation, this paper provides a theoretical basis with practical application value for the realization of the accurate, efficient

and benign development of piano teaching.

II. THE MAIN BODY OF THIS PAPER

A. The overview of systematic thinking and the proposal of "Four Main Factors" in piano teaching

1) Overview of systematic thinking

Thinking is a kind of active reaction to objective reality through the brain's judgment, reasoning, etc., which involves all cognitive or intellectual activities to explore and discover the inner connections and laws of things. The mode of thinking is a comprehensive form of expression in which people use thinking laws and thinking methods to carry out thinking activities^[2].

Systematic thinking mode is to use the concepts, theories and methods of system science, focusing on the overall analysis of the main factors within the system and the relationship between system and external environments, and revealing the system structure, function and changing laws. The basic idea of understanding the object is to regard the object as a system consisting of all main factors and having certain functions, and the main factors here can also be regarded as subsystems. Then, by applying the theory of system science, it focuses on examining the links between the various parts and analyzing the characteristics of integrity, relevance, purpose, hierarchy, dynamics, environmental adaptability, complexity, synergy, similarity and so on, thus put forward the ideas and methods to solve the problem. Integrity means that the whole system consisting of various factors has a new function which is different from the simple addition of each factor.

2) The proposal of "Four Main Factors" in piano teaching

From the perspective of systematic thinking, piano teaching can be seen as a system. Because the number of teaching objects of piano is relatively small, which even needs one-to-one guidance sometimes; piano teaching has its unique characteristics. We can divide the sub-systems from the perspective of piano playing. The original meaning of touch is that the nerve cells distributed on the skin of the whole body receive the sensation of temperature, humidity, pain, pressure and vibration from the outside world. Specifically, the touch of piano playing mainly refers to the feeling of a person's hands and feet on the position, speed and intensity of the keys. Tactile and well-known hearing and vision are all sensory systems that play an important role in piano playing. Whether they can coordinate or not has aroused the interest of many researchers in the music field. Therefore, it is natural to regard hearing,

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vision and touch as the three participating subsystems of piano teaching system. However, in addition to fingers movement, ear listening, eyes watching, playing the piano requires brain thinking too. In order to truly exert a comprehensive synergy of various sensory--hearing, vision, touch and perception, and effectively stimulate the development of brain cells as well as further improve the piano player's observation, comprehension, playing ability, listening ability, memory and imagination, so that the learner's performance ability, effect and intelligence can be improved comprehensively. Therefore, the participation of the brain is indispensable. Vision, hearing, touch and consciousness are the four main factors involved.

Now the theory of "four main factors" in piano teaching is put forward: piano teaching system is an interrelated and interacting organic whole composed of four subsystems: hearing, vision, touch and consciousness. The "consciousness" here includes the sentiment of the role of musical instruments, the content of lyrics, the theme of the song, and the change of the plot of the song. Vision depends on the eyes, hearing depends on the ears, touch depends on the hands and feet, and consciousness depends on the brain and heart. Therefore, piano teaching must strengthen the training of four main factors, namely, hearing, vision, touch and consciousness, as well as strengthen the coordination so as to play the overall function of the teaching system.

B. An analysis of factors in piano teaching systems

In the "Four Main Factors Theory" of piano teaching proposed in this paper, the four main factors involved are hearing, vision, tactility and consciousness, which have their own system functions and characteristics. Teachers need to master these characteristics skillfully in order to teach students in accordance with their aptitude and be able to integrate the teaching contents.

1) Main factors of consciousness participation

Music is a dynamic, passionate and creative art. Through the study of the relationship between brain and performance behavior, people find that the piano playing process is a fast-moving process of the player's psychological and physiological functions. During this process, either conscious or unconscious playing is a kind of activity which in different levels, relatively complex and changeable and two-way connected. When the playing process begins, the brain controls the movement of the finger and gives instructions to the finger. Finger provides the corresponding information for the brain in turn. The information is difficult to be captured and acquired by the brain itself through other channels^{[3],[7]}. On the other hand, although piano playing skills are important, piano playing still needs a kind of "spirit". As Wilhelm Furtwängler pointed out: although some skills alone may achieve "good results", even if their skills can produce results, it is also irregular, because aimless skills are divorced from the fundamental pursuit of music art. In *About Music*, he also believes that for good performance, skills should not be separated from "spirit" for a second. Once skills are treated as purposes, the "spiritual" unity of the whole performance will be blocked^[4].

Not only the music playing itself should have spirit, but also the vision, hearing and touch must follow the "command" of the brain. Therefore, a kind of "consciousness" is needed to

lead. Perhaps it is the realization of the function of musical instruments, the content of lyrics, the theme of songs, and the change of the plot of songs and so on. Consciousness depends on the brain and heart to produce and play a role. Piano playing process is a complex motion control system. It needs to combine visual, hearing, touch and other actions, as well as constantly coordinate with the perceptual nervous system and the brain. Piano playing needs interest, and interest is closely related to "consciousness". Piano performers need to open "consciousness" to understand, think and comprehend the melody and content of songs, and through close cooperation with vision, hearing and touch, they can play beautiful and emotional music smoothly. It is hoped that the emotional communication and resonating of the repertoire, the performer and the audience will be triggered.

Therefore, no matter in the interpretation of music or in the training of skills, the brain and conscious participation must be analyzed, otherwise it is difficult to achieve good playing effect, and artistic image cannot be talked about. Of course, the player needs a longer practice exercise, so that the adaptability and versatility of the brain response can be strengthened and the coordination between various perception bodies and brain is more natural and more sensitive.

2) Main factors of vision participation

When playing piano, vision is the most basic and with intuitive functions in the three sensory systems of hearing, vision and touch. The first threshold in piano teaching is spectrum reading. First of the main function of the visual subsystem is music spectrum reading. The music spectrum records the information of pitch, timbre, volume, mode, tonality, prosody, rhythm, beats, intensity and so on. The performers need to understand the process and integrate the playing information through the brain, and then press the keys to output the corresponding music. The music score contains all the information and basic intention expressed by the composer. The more comprehensive and accurate the information obtained by the performer on the music spectrum, the more accurate and rich the music content can be expressed. Second is the key face vision, piano is composed of 88 keys, which are divided into black keys and white keys. Players can accurately play various combinations of sounds or sounds in different phonological domains on the piano. This is the pitch position of the keys that should be touched by fingers when the visual system transmits the position of the piano keyboard to the brain, therefore the visual subsystem also directly affects the accuracy of music performance. In the meantime, key face vision also provides information sources for the following memory vision.

The visual objects of the front spectrum reading vision and the key plane vision are objective existence, which are the objective reflection of the human visual organs to the things they see. In addition, there is a visual object that is not objective vision, i.e. memory vision, which depends on the human brain's understanding of visual perception and memory storage. Because in the process of playing the music spectrum, the player recalls the visual experience in the past life by playing back the visual experience of reading the spectrum in the brain, or playing back the position of the keyboard, or according to the music information provided. The stored scenes

provide the material for the emotional expression of music with imagination. Therefore, memory vision is a common memory method used in piano performance.

3) *Main factors of hearing participation*

Boris Berman put forward the concept of "ear of music", pointing out that pianists should have their own imagination of the voice they need to play - "subjective ear" and adjust the voice emitted by fingertips - "objective ear". The playing process is based on the brain's control of hearing. The piano's voice is a very complex process composed of players' different strength, various time-value sounds in combination and comparison^[5]. It is necessary to make the inner "auditory desire" achieve the unity of sound, content and spirit through the playing function.

Therefore, piano performers need to have the sense of hearing. Before using keyboard to reproduce the music of original works, they should have the sense of meeting their own inner auditory requirements before playing each musical notation. They should have the ability of hearing, and be able to distinguish the tone syllables of music through hearing, deeply understand the emotions contained in the repertoire, and accurately listen to the effect of playing the piano. They should have imagination, in the process of playing, and can produce the auditory imagination of the music works through the organic combination with the performance function. They should have "auditory desire", the performer should have the pursuit of concrete reproduction of the fixed music works through sound materials and artistic means, and also gradually learn to distinguish melody, rhythm and timbre in the appreciation of other people's performance. The performer should be confident to play a soulful and beautiful piece with affection.

4) *Main factors of touch participation*

In piano playing, performers should first use five types of touch keys flexibly, such as raising fingers, wrist coordination, sticking keys, natural gravity, low position, etc.^[6], grasp the size, flexibility and strength of touch keys (including pedals), limb movement, master the playing methods of wrists and fingers skillfully, practice the basic skills of flexibility and sensitivity of hands, and cultivate good touch and tactile coordination.

Next, skills should be underlined, such as economical skills, by which the players can use the least energy in the performance process to achieve the optimum effect of the melody performance; pay attention to extension skills, players fingers, wrists, arms and other functional organizations of each different part, can become a continuous link to connect music. Through linkage and coordination of sensory connection such as fingers, palms, wrists, arms and other touches, and the coordination of different keys, they form their own playing skills and produce beautiful music, as well as further vividly and accurately deduce and express the ideological content contained in the music works to achieve the best musical function and rendering effect.

C. *Systematic thinking analysis on "Four Main Factors Theory" of piano teaching method*

After having a clear understanding of the main factors of the piano teaching system, teaching specific group or individual students are all system engineering. System engineering should first clarify the purpose of the piano teaching system, and then formulate, implement and optimize teaching programs, strengthen teaching coordination and control, as well as give full play to the overall function of the teaching system.

1) *Pay attention to hearing literacy and clarify the purpose of teaching*

System engineering should first clarify the purpose of the teaching system. The whole course has the teaching purpose of the course, and each part and each class have their own teaching purpose. For example, in piano teaching for beginners, the formation of "auditory desire" should be regarded as the basic teaching purpose at the beginning. In the process of piano teaching, the relationship between teachers' teaching and students' learning should be recognized and dealt with properly. Many aspects of students are related to teachers' teaching. Teachers, as the main body of the teaching process, have a clear leading role. They should be good at discovering students' playing errors by their own sensitive hearing, and then carry out guidance and teaching in a targeted way.

It is necessary to distinguish different levels of students and teach them in accordance with their aptitude. For the beginners, the basic skills of hearing should be trained. For those who have a certain foundation, the training of hearing advanced skills should be taken into account. Teachers should not only have the ability to analyze students' piano foundation and acceptance level, but also have excellent teaching methods and appropriate teaching means, so that the teaching process can be more targeted and effective.

2) *Strengthening visual training and implementing teaching programs*

The most important link is the design and implementation of piano teaching plan. Teachers should not only understand and comprehend the teaching requirements and training programs, adopt appropriate teaching methods, but also carefully observe, consider and comprehensively analyze the conditions of students in all aspects when listening to their playing. They should make a holistic analysis as far as possible from the inherent artistic potentiality, psychological state and talent, to the external coordination ability and musical performance characteristics, so as to have a good idea about that. Students should not only look at music score and keys with their eyes, but also understand the contents and implications of music score beforehand. They are good at using vision to capture and attach importance to the key points and methods suggested by teachers in the process of teaching and commenting. They should cultivate visual sensitivity and actively interact to clarify the main intention of solving problems and improve self-organization of learning.

Whether the teaching content of teachers meets the requirements of the teaching plan, whether the teaching ideas are clear and definite, whether the teaching methods are logical and pertinent, and so on. It will directly affect the students'

understanding and acceptance. Therefore, teachers' visual foundation in pre-class preparation and classroom teaching is the primary premise to establish the normal cycle of piano

3) Strengthen touch training and timely teaching control

The process of teaching implementation needs timely and effective coordination and control. Whether for teachers or students, in the interpretation of music works, in addition to conscientiously understanding the symbols and annotations indicated by the composer in the music score, we should further understand the music language and characteristics of these symbols, accurately find the position of each note in the piano, and embody it through tactile fingering. This requires teachers to have a higher ability to interpret music, they need profound and extensive knowledge, grasp their relevance. Tactile needs experience summary and time accumulation. Many problems of music processing and interpretation are not just about what to do or not to do, but about how much to do and how to do it, which involves how to control the content, method and degree of teaching. To train and cultivate students' musical sense of touch, it is necessary to go through a process of re-practice in the reciprocating cycle of practice and theory, and because the sense of touch has inertia, it is necessary to have systematic thinking in analyzing.

For example, some students may have abnormal musical performance, which may be related to the student's degree of preference or understanding of the works, may be related to the proficiency of his or her skills, and may be related to excessive or inappropriate of teacher's guidance. These all require timely corrective action.

There are many similarities between piano teaching and other art teaching methods. Teachers may cause students to have new doubts in the process of learning. Different teachers may put forward different opinions on the understanding and interpretation of the content of the same musical work and the performance of playing techniques. Especially in the aspects of subjective music processing and artistic taste, different opinions are normal phenomena. Teachers should learn to take appropriate control measures when they encounter similar situations. For the highly practical course of the piano, teachers sometime properly demonstrate in person and let students experience their sense of touch, which is also a good way to improve the teaching effect.

4) Exploiting the potential of consciousness and optimizing teaching methods

Although consciousness and vision, hearing, touch are all elements of the piano teaching system, according to the structural characteristics of this system, the awareness elements play a leading role in the other three elements. Therefore, teachers consciously cultivate the initiative, consciousness and order of students' learning while teaching, and induce students' savvy, which has very positive significance for students to improve learning efficiency and accelerate the pace of progress.

Therefore, piano teachers should be good at trying to observe, understand and excavate the autonomous nature of the students themselves, be good at optimizing teaching methods,

teaching mode, and also plays an imperceptible demonstration function for students' visual training in the dynamic teaching process.

and stimulate students' awareness potential and independent creativity. Teachers should try to avoid using dull language and forced teaching. Heuristic ways should be used to stimulate students' visual, auditory, tactile, conscious, and even illusory imagination.

Teachers use the system openness thinking to recommend relevant literature, writings, reviews, and audio concerts also helps to develop students' autonomy and creativity in musical performance. When students have a full understanding, experience and perception of the correct teaching and learning style, they are easy to integrate into the emotions of the piano repertoire, and then achieve the artistic effect with half the effort.

The training of "four main factors" is very important, but at the same time, it should be emphasized that the synergy and integration between them are more important. The key criterion for judging teaching effectiveness is whether the overall function of " $1 + 1 > 2$ " can be produced.

III. CONCLUSION

Piano teaching is regarded as a system in this paper, and the "four main factors" theory is put forward for the first time by using systematic thinking. The "four main factors" of piano teaching system are consciousness, vision, hearing and touch together. It also expounds in this paper that vision depends on eyes, hearing depends on ears, touch depends on hands and feet, and perception depends on brain and heart. Thus it will achieve synergistic effect of multiple senses. It is the theoretical innovation of this paper to form the concept, meaning and positioning of "consciousness" in piano teaching. In addition, the training and coordination methods of "four main factors" are discussed. It is hoped that this method will be of practical reference value for improving learners' performance ability, effect and intelligence, and for improving the overall function of piano teaching.

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