

# Loudness and Pitch of Kunqu Opera

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**Summary:** Equivalent sound level (Leq), sound pressure level (SPL), and fundamental frequency ( $F_0$ ) are analyzed in each of five Kunqu Opera roles, *Young girl* and *Young woman*, *Young man*, *Old man*, and *Colorful face*. Their pitch ranges are similar to those of some western opera singers (alto, alto, tenor, baritone, and baritone, respectively). Differences among tasks, conditions (stage speech, singing, and reading lyrics), singers, and roles are examined. For all singers, Leq of stage speech and singing were considerably higher than that of conversational speech. Interrole differences of Leq among tasks and singers were larger than the intrarole differences. For most roles, time domain variation of SPL differed between roles both in singing and stage speech. In singing, as compared with stage speech, SPL distribution was more concentrated and variation of SPL with time was smaller. With regard to gender and age, male roles had higher mean Leq and lower average  $F_0$ , MF0, as compared with female roles. Female singers showed a wider  $F_0$  distribution for singing than for stage speech, whereas the opposite was true for male singers. The Leq of stage speech was higher than in singing for young personages. Younger female personages showed higher Leq, whereas older male personages had higher Leq. The roles performed with higher Leq tended to be sung at a lower MF0.

**Key Words:** Equivalent sound level–Sound pressure level–Fundamental frequency–Kunqu Opera–Task–Condition–Singer–Role.

## INTRODUCTION

The Kunqu Opera is a traditional performing art in China. It has been handed down orally since the middle of the 16th century and is revered as the ancestor of all Chinese Operas. It is commonly praised for its elegant phrases, wonderful stories, and beautiful melodies and is performed by at least 10 artists, Jing, Guansheng, Jinsheng, Laosheng, Fumo, Zhengdan, Guimendan, Liudan, Fuchou, and Xiaochou, each with a special voice timbre.<sup>1</sup> The roles can be divided into five groups, namely:

1. Sheng (*Young man* roles) recites and sings in both modal and falsetto register. Both Guansheng, who wears an officer's hat, and Jinsheng, who wears a headband, change their voice quality according to the age and identity of the personages. A Guansheng performer acts as a young king or a gifted scholar, and his voice quality has been described as "broad and bright" having "a heavy oral resonance." Jinsheng performers often act in love stories and sing with a brighter, lyrical voice.
2. Dan (*Female* roles) includes Laodan (*Old woman* role), Zhengdan (*Middle-aged woman* role), Guimendan (*Young woman* role), and Liudan (*Young girl* role). To portray their different ages and identities, Dan performers sing with different voice qualities; in general, the older the personage, the greater the proportion of modal voice. Thus, Laodan performers recite and sing with loud modal voice, Liudan performers with falsetto voices, whereas Zhengdan and Guimendan use both these registers.
3. Jing (*Colorful face* roles) performers sing with their faces painted in different colors depending on the identity of

the personage. The voice quality has been described as "resonant and vigorous." Often, they use a series of special effects to display different characters, such as voice bursts and "intense resonance."

4. Mo (*Old male* roles), including Laosheng (*Old man* role) and Fumo (second *Old man* role), recite and sing in modal register. Laosheng performers play the roles of middle-aged or elderly gentlemen. The Fumo performer introduces the story at the beginning of the performance.
5. Chou (*Buffoon* roles), including Xiaochou (*Clown* role) and Fuchou (second *Clown* role), recite and sing with register shifts between falsetto and modal. Fuchou pays more attention to expression than to voice. Xiaochou is a comical role performed with a loud and clear voice.

Summarizing, the voice timbres mirror the ages, characters, and identities of the various personages. The voice qualities deviate dramatically from both conversational speech and Western operatic tradition, which have been well described in previous research.<sup>2–4</sup> In contrast, few attempts have been made to describe the acoustic characteristics of Kunqu Opera roles in scientific terms, although these characteristics possess a general relevance from the point of view of voice science, illustrating the flexibility of the human voice and exemplifying how the voice can be used in artistic, musical, and dramatic contexts. The present study investigates the 1) differences among roles; 2) differences among singing, stage speech (also called recitative in Peking Opera<sup>5</sup>), and reading lyrics; 3) intrarole differences between songs; and 4) differences between singers of the same role. The investigation focusses on two primary acoustic properties of the voice, loudness and fundamental frequency ( $F_0$ ), in five Kunqu Opera roles, two female (*Young girl* and *Young woman*), and three male (*Colorful face*, *Old man*, and *Young man*).

## METHODS

Four female and six male professional performers of Kunqu Opera, aged 25–47 years, volunteered as subjects, two

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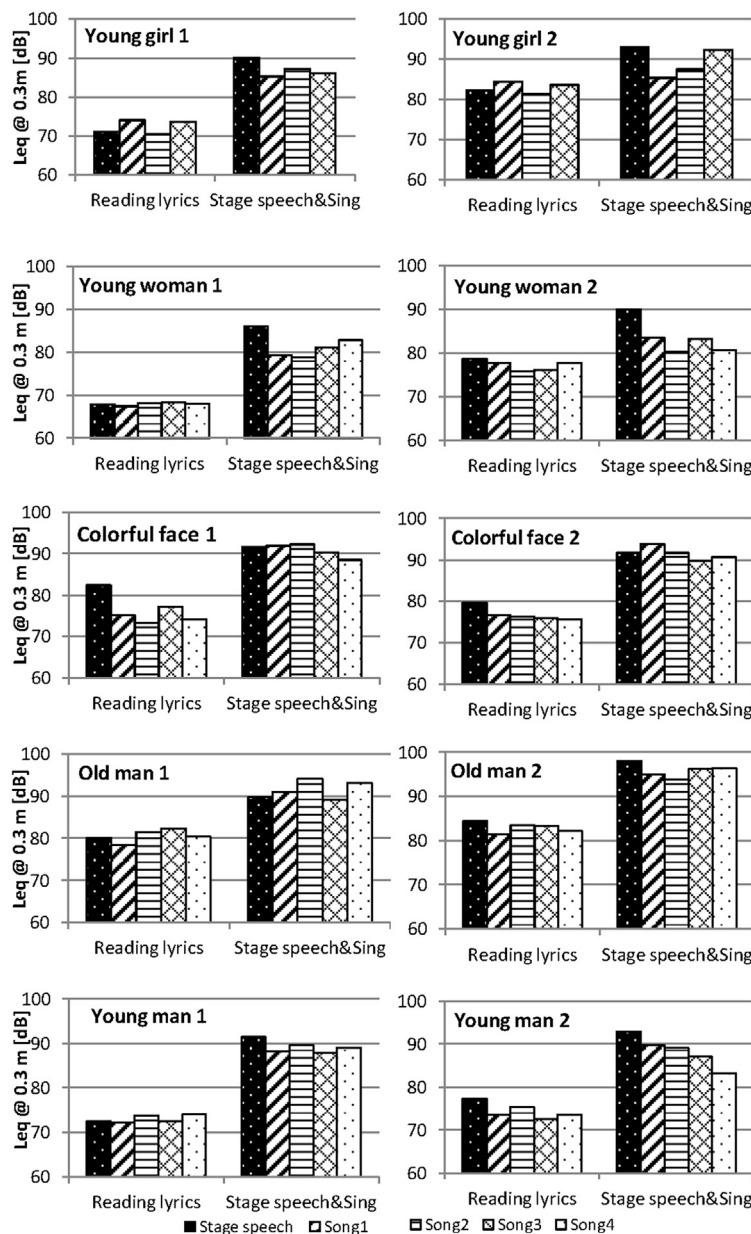
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**TABLE 1.**  
**Ages (y) of the Ten Performers**

Roles	Young Girl	Young Woman	Colorful Face	Old Man	Young Man
Singer 1	45	47	27	46	45
Singer 2	41	27	25	44	27

performers in each of five roles (Table 1). Their professional experiences varied between 7 and 27 years. The singers were told to sing just as on stage. As there are no songs that are common to all these roles, the singers were asked to perform three or four songs of their own choice that belonged to their repertoire at the time of the recording. The songs had duration of between 2 and 3 minutes and differed in emotional color. The two *Young girl*

singers sang only three songs because one of the songs was very long. The singers also recited a section of stage speech. In addition, all singers read, in modal voice, the lyrics of the songs chosen, duration between 2 and 3.5 minutes. The language differed from Mandarin Chinese but was identical with what they used in their roles on stage, which actually corresponds to ancient Chinese.



**FIGURE 1.** Leq at 0.3 m for reading lyrics, stage speech, and singing. In each panel, the left group of columns shows the Leq values of the reading of the different lyrics, and the right group the Leq values of stage speech and three or four songs.

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