An overview of the authors' research on perception and production of singing voice as well as on the methods of voice training is presented. In the first study, a correlation was found for a group of voice students between the duration of training and the strength of the singer’s formant, while the tone quality estimates were not significantly higher for students with longer practice years. In the second study we investigated possible acoustical correlates of the 'forward'/backward placing of a voice. A 'forward' placed voice may have higher F1, F2 and/or the singer’s formant frequencies as well as a higher level of the singer’s formant. In the third study we investigated the intonation accuracy in a cappella performance. There are considerable inter-individual differences between performers as to their adjustment of pitch level. The stability of intonation varies significantly both within and between performances of the vocal exercise as well as between its consecutive renditions. There is a positive correlation between the deviation of a melodic interval from its equally tempered standard value and the number of out-of-tune judgments by the listeners. The dispersion of out-of-tune judgments is considerable, which suggests that listeners might have adopted different criteria for intonation accuracy.

Johan Sundberg has had a strong interest in the vocal behavior of singers of different styles and nationalities. This tribute talk emphasizes the voluntary change of rate of fundamental frequency in performance singing of ornaments and vibrato. The "taan" gestures from Northern Indian classical singing, the "pulse patterns" in Carnatic Southern Indian classical singing, and pitch change in classical western coloratura singing constitute the primary corpus for this study of Fo rate change. Rate of Fo change varied from approximately 20 to 120 STS for soprano pitch change, 8 to 20 STS for the Southern Indian pulse patterns, and 7 to 60 STS for the Northern Indian taan gestures. What these rates depend upon and rates from other ornaments will be discussed, as well as the relation to maximum Fo rates in the literature, performance needs, perceptual characteristics, and control.

Acoustical methods can provide a reliable and objective estimate of singing proficiency in the general population, in terms of pitch and temporal accuracy. E.g., Dalla Bella, Giguère, & Peretz, (2007). The majority, when asked to sing a well-known song at a slow tempo, are as proficient as professional singers. Nonetheless, some nonmusicians exhibit poor singing. This deficit is mostly limited to the pitch domain and sometimes is not accompanied by impaired perception. More recently, singing proficiency was examined in nonmusicians with tasks extending beyond singing familiar melodies. Forty participants imitated single pitches, intervals, and short melodies; in addition, participants sang three well-known melodies at a spontaneous tempo and at a fixed slow tempo. Additional tasks (e.g., Montreal Battery of the Evaluation of Amusia) were carried out to assess participants' perceptual abilities. Acoustical analyses of vocal performance revealed that the majority of nonmusicians sung in tune and in time, thus confirming previous findings. Still, various patterns of poor singing emerged from the analyses of pitch and time accuracy (e.g., poor pitch singing with or without perceptual deficits). The relationship between perception and performance mechanisms in vocal production will be discussed.