

# EMOTION RECOGNITION FROM SINGING VOICE IN CONTEMPORARY COMMERCIAL AND CLASSICAL STYLES

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This study concerns the recognition of emotion from Contemporary Commercial Music (CCM) and Classical styles singing. Thirteen singers (11 female 2 male) with a minimum of 3 years of professional level singing lessons with expertise in CCM or Classical technique or both participated. They sang at three pitches (Females 220Hz, 330Hz, 440Hz, Males 110Hz, 165Hz, 220Hz) expressing anger, sadness, joy, tenderness and neutral states. Twenty-nine listeners listened to 312 short (0,63-4,8 s) voice samples, out of which 135 were sung using classical singing technique and 165 samples in CCM-style. The listeners were asked which emotion they heard.

Percentage of correct recognitions out of all the answers in the listening test (N=9048) was 30.2%. (one proportion z-test against random recognition H0:  $p=1/5$ : z-value 24, p-value $\ll 0.001$ , Cronbach's alpha 0.89). Samples of the female singers show statistically significant difference in the correct recognition of the emotion between CCM and Classical –style vocal techniques. Recognition percentage of the samples sung using CCM –style was higher, 35.2% (N= 4698), than for the samples of Classical –style, 23.9% (N=3480). The statistical significance of the 11.3% difference in recognition was calculated using the Pearsons Chi-square test of homogeneity (z-value 120.2, p-value $\ll 0.001$ ) Recognition of the male singers CCM and Classical style samples were not statistically different. Recognition percentages were 27.4% (N=435) for CCM and 29.4% (N=435) for Classical. (Pearsons Chi-square z-value 0.5 and p-value 0.5).

Pitch played a role in emotion recognition. A lower pitch (220Hz) increased the likelihood to correctly assess sadness from the female singing voice from 35.4% to 55.5% (male voice 110Hz from 42.6% to 55%). High pitch (440Hz) increased the likelihood of recognizing joy from the female voice from 19.4% to 41% (male voice 220Hz from 12.1% to 27.6%) and middle pitch e (330Hz) slightly increased the likelihood of recognizing tenderness from female singing voice (from 23.3% to 30.1%) (male voice 165Hz from 29.3% to 41.4%).