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Title: Cantonese Consonant Perception in Quiet and in Noise in Young and Old adults

Abstract (500 words)

Speech perception in noise is challenging even for people with normal hearing. Factors that affect speech perception in noise include phonetic features of the speech sound, acoustic properties of the noise, signal-to-noise ratio, and the auditory status and cognitive ability of the listener. Some studies have examined the differences in the cognitive functions in young and old adults and their relations to speech perception ability. Few studies have compared perception of different phonetic features in young and old adults in different types of noises. The present study examined the perception of Cantonese consonants in four types of noises in healthy young and old native speakers of Cantonese with normal hearing sensitivity. The research questions were: Do aged adults perceive Cantonese consonants as accurately as young adults? What is the effect of noise on Cantonese consonant perception in young and old adults? What is the relative difficulty in perceiving the phonetic features of consonants in noise in young and aged adults? Which type of noises poses more difficulty for Cantonese consonant perception?

Twenty young adults (18-23 years old) and twenty aged adults (60-71 years old) listened to 76 monosyllabic words (19 consonants x 2 words x 2 speakers) in quiet and the same productions in 608 trials (76 words x 2 SNRs x 4 noises) with two signal-to-noise ratios (0 dB, -6 dB) and in four types of noises (2-male-talker babble, 2-female-talker babble, ten-talker babble and speech-shaped-noise). All participants passed hearing screening and scored within normal range in the Cantonese version of the Mini-Mental State Examination to rule out cognitive impairment.

The results showed that young adults identified the consonants with perfect accuracy ($M = 99\%$). Despite normal hearing sensitivity, older adults perceived the consonants significantly poorer than young adults in both quiet and noise ($p < .001$). The significant interaction between age group and accuracy ($p < .001$) indicated that noise had a more detrimental effect on aged adults than young adults. In terms of perception of phonetic features in noise, both young and old adults showed by and large similar patterns of difficulty. Aspiration features were the easiest to identify followed by manner of articulation. Place of articulation was the most difficult to perceive in noise. Aspirated stops were easier to perceive than unaspirated stops. Among the different manner of articulation, affricates were the easiest to identify. Nasals, stops and glides were of medium difficulty, while fricatives and liquids were the most difficult. In terms of place of articulation, overall, the labial-velars and palatals were the easiest to perceive, followed by alveolars and velars. Bilabials, glottals and labiodentals were the most difficult. Old adults performed poorer than young adults in all four noises. For both young and old adults, the order of accuracy for Cantonese consonant identification in the four noises from the highest to the lowest was: two-male talker-babble, 2 female talker-babble, speech-shaped noise and ten-talker babble. Difference in accuracy between the young and aged adults in speech-shaped-noise was less than that in the other three noise types.