

Production and perception of vocal emotions: A comparison of Mandarin Chinese and German emotional prosody

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Cross-cultural studies like [1], [2] on vocal emotions point out that emotional prosody exhibit a core set of acoustic-perceptual features, which promote accurate recognition across languages. Still, culture- and language-specific paralinguistic patterns affect the encoding and decoding of vocal emotion expressions, which lead to an in-group processing advantage [3]–[6]. However, it is unclear in which way suprasegmental properties vary in different languages and lead to different mappings of expressions to emotional meanings. To follow up on this issue, the present study aimed to compare the production of vocal emotions in the tonal language Mandarin Chinese and the non-tonal language German. It will be assessed how language and culture affect the production and perception of vocal emotions in Mandarin Chinese and German. First, we selected ten bisyllabic German words and ten Chinese words from the category »food« as stimuli. Then, three female native German and Mandarin Chinese speakers recorded the stimuli in their native language in four emotions (HAPPINESS, PLEASANT SURPRISE, SADNESS, DISGUST) and in NEUTRAL mode.

The stimuli's acoustic characteristics (pitch, duration, and intensity) were analyzed with *Praat*. [7] The German trochaic intonation of the stimuli was signaled by a pitch fall on the second syllable in all the emotions, except for PLEASANT SURPRISE, which had an M-H pattern opposite to the NEUTRAL condition. However, the Chinese words exhibited their lexical tonal forms without pitch falling in all emotions. An ANOVA comparing the parameters pitch and duration within each language revealed significant differences in pitch between NEUTRAL and the emotional prosodies HAPPINESS and PLEASANT SURPRISE in both languages. The positive emotions had a higher pitch (see Table 1). Furthermore, differences between NEUTRAL and the emotional prosodies DISGUST and SADNESS compared to the other emotions in both languages are expressed basically by word duration, i.e., negative emotions were produced with a longer duration.

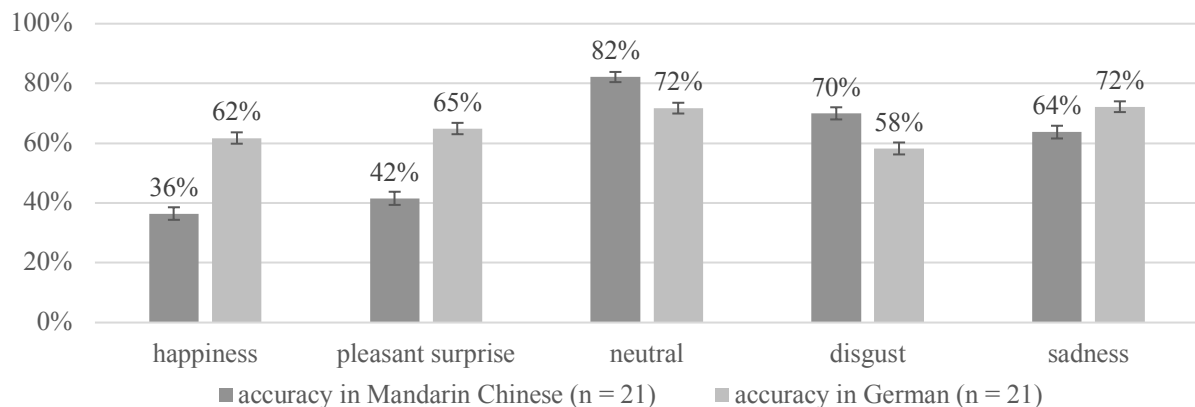
Additionally, perception tests were conducted in a forced-choice task with six response options (five emotional conditions plus one for 'others'). Twenty-one native Mandarin speakers (12 females, mean age of 31.33 years, age range 23-41 years) judged on the expressions in Mandarin Chinese and twenty-one native German speakers (12 females, mean age of 28.86 years, age range 21-54 years) on those in German. The reaction times of German native speakers (mean = 2.13s, SD = 0.73) were shorter than those of the Chinese native speakers (mean = 2.25s, SD = 0.72) and the overall accuracies higher for the German group compared to the Chinese group (66% in contrast to 59%). Both groups performed best with regard to the categorization of the NEUTRAL condition (see Figure 1). However, native Mandarin speakers performed particularly worse when it comes to the interpretation of the positive emotions HAPPINESS and PLEASANT SURPRISE. Such a performance difference between positive and negative emotions was not observed in the German group.

In sum, our behavioral results are in line with the results reported in Liu and Pell [8]. We also found that the Mandarin Chinese listeners recognized the positive emotions of HAPPINESS and PLEASANT SURPRISE less accurately. The group differences in both the production and the perception tasks suggest language specific effects on the processing of emotional prosody at least when the words varying in emotional prosody are presented without any contextual information. In the talk, we will discuss how the observed differences can be explained on the basis of language and culture specific factors.

Table 1: Overview of mean F0, mean duration, and mean dB taken from acoustical analyses comparing all presented emotions in Mandarin Chinese and German

conditions	mean F0		mean duration		mean dB	
	Chinese	German	Chinese	German	Chinese	German
NEUTRAL						
1. syllable	217.00	249.45	343.83	309.17	67.70	72.57
2. syllable	238.11	185.06	360.77	463.26	66.31	68.08
HAPPINESS						
1. syllable	249.00	359.17	297.45	301.56	71.48	78.26
2. syllable	301.27	213.85	358.07	525.39	70.19	74.04
PLEASANT SURPRISE						
1. syllable	282.20	281.18	276.07	366.90	72.74	77.35
2. syllable	365.73	317.76	347.88	533.98	72.42	74.66
DISGUST						
1. syllable	229.11	237.30	383.90	425.00	67.57	75.13
2. syllable	214.53	174.90	476.67	593.00	66.68	69.17
SADNESS						
1. syllable	210.35	217.46	453.53	384.23	64.29	67.77
2. syllable	208.31	188.33	595.07	575.85	63.11	64.04

Figure 1: Behavioral results of the categorization of vocal emotions in Mandarin Chinese and German by the native speakers of both languages



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