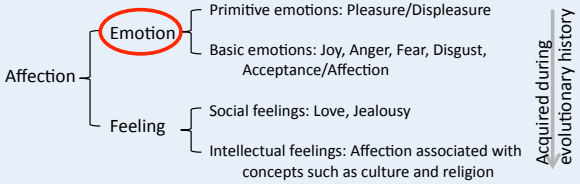
Similarity of Effects of Emotions on the Speech Organ Configuration with and without Speaking

Tatsuya Kitamura
Konan University, Japan
t-kitamu@konan-u.ac.jp

Aim

In this work, we propose a hypothesis on the mechanisms of emotional speech production and verify it by measuring the speech organ configuration of participants expressing primitive emotions.

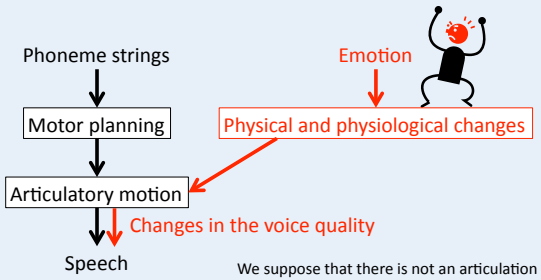
Definition of "Emotion" in This Study



(Fukuda, 2008)

Side Effect Hypothesis of Emotional Speech Production

Emotions induce physical and physiological changes in the whole body including changes in the configuration and physical/mechanical properties of the speech organs, regardless of whether or not the person is speaking, and as a side effect, this changes the voice quality.



We suppose that there is not an articulation target for emotional speech production.

To verify this hypothesis, we compared the speech organs configuration of participants expressing emotions with and without speaking.

Acknowledgements
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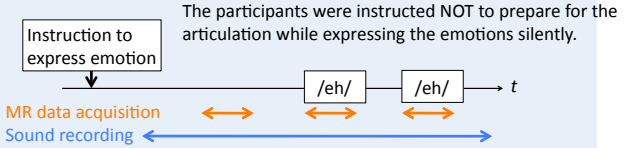
Experiment 1: Simulated Emotion

Methods

- MRI scanner: Shimadzu-Marconi MAGNEX ECLIPSE 1.5 Power Drive 250
- Participants: 2 Japanese professional actors (1 male & 1 female)
- Emotions: Neutral, Hot anger, Joy, and Sadness
- The participants were asked to take on the role of Speaker B and utter /eh/.
- Dialogues:

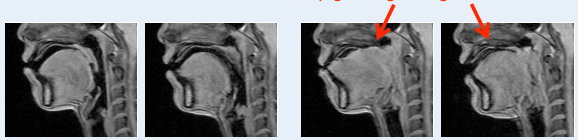
Hot anger	A: That was a complete lie. B: *Eh*, I can never forgive you.
Joy	A: You've got a job offer? B: *Eh*, yes, I have.
Sadness	A: You broke that expensive dish? B: *Eh*, yes, I did.

- Data Acquisition:



Results

1. The lower jaw is pulled backward.
2. The pharyngeal and laryngeal cavities are narrowed.
3. The laryngeal height is higher than that for neutral.



1. The pharyngeal and laryngeal cavities dilate.
2. The laryngeal height is lower than that for neutral.

The pharynx and larynx are blurred. (These parts moved during scanning.)

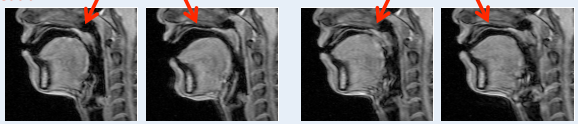


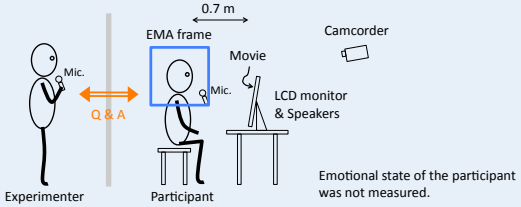
Fig: Midsagittal MR images of the female actor.

The effects on the speech organ configuration due to emotion in the nonspeaking states are retained during speech.

Experiment 2: Spontaneous Emotion

Methods

- EMA system: Carstens AG500
- Participant: 1 Japanese male with no theatrical experience
- Experimental setup:



- Conditions:
  1. Present a relaxation movie → relax
  2. Present a horror movie → fear and tension
- The experimenter asked casual questions about the participant's interests, and the participant was asked to add a filler /ehQto/ at the beginning of each answer.

Results

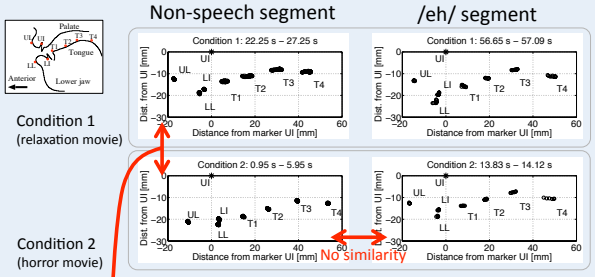


Fig: Relative positions of the 8 makers.

Emotion can affect the speech organ configuration even if the participant did not speak.

Conclusions

- Emotions affect the speech organ configuration regardless of whether or not the person is speaking.
- The effects on the speech organ configuration in the speaking and nonspeaking states are similar for emotions (Exp. 1).
- We cannot exclude the possibility that the participants prepared for the articulation during the nonspeaking states.