정서의미 전달에 있어서 운율과 단어 정보의 상호작용.

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Interaction between emotional content of word and prosody in the evaluation of emotional valence

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Abstract

The present paper focuses on the interaction between lexical-semantic information and affective prosody. The previous studies showed that the influence of lexical-semantic information on the affective evaluation of the prosody was relatively clear, but the influence of emotional prosody on the word evaluation remains still ambiguous. In the present, we explore whether affective prosody influence on the evaluation of affective meaning of a word and vice versa, using more ecological stimulus (sentences) than simple words. We asked participants to evaluate the emotional valence of the sentences which were recorded with affective prosody (negative, neutral, and positive) in Experiment 1 and the emotional valence of their prosodies in Experiment 2. The results showed that the emotional valence of prosody can influence on the emotional evaluation of sentences and vice versa. Interestingly, the positive prosody is likely to be more responsible to this interaction.

I. Introduction

Recently, there is a growing interest in emotional prosody in language because of the development of pathology related to language and human-machine communication for automatic speaker state recognition [1]. Commonly, there are two separate levels on which speaker's emotion can be recognized through a linguistic utterance. First, we can directly understand the emotional state of speaker through lexical content of words or sentences. Second, emotion can be expressed by prosodic features. The final meaning of an utterance can be determined by the interaction or competition of these two levels that can be congruent or incongruent in emotional meaning. Sometimes, we can be angry not because of "what he says" but because of "how he says it" and vice versa..

Grimshaw (1998)[3] conducted one of the few investigations related to emotional prosody and word interaction. She used a Stroop like task in which the words "mad," "sad," and "glad" in three different emotional tones were presented. In the task of emotional evaluation of prosody, the results showed a similar pattern of the response latency with affective priming effect: the response latency was faster

when the valences of prosody and lexical content of word were congruent than when they were incongruent. But interestingly, this effect disappeared when the emotional valence of word was asked to evaluate. Thesame pattern of results was found in Kitayama & Ishii (2002)[4] with American listeners. According to the assumption of automaticity in Cohen, Dunbar, & McClelland, 1990, this one direction interference effect suggest that emotional connotation of word is processed automatically whereas the processing of emotional prosody is notor less automatic than the word processing of emotional content. In this case, the emotional content of a word can affect the judgment of emotional valence of the prosody but the inverse direction is impossible.

But these results were not consistent with the studies of Schirmer and Kotz (2003) [5] and Kitayama & Ishii (2002) [4] with Japanese participants in which the emotional congruent effect was found in both word evaluation and prosodic evaluation task. Finally, the influence of emotional word on the affective evaluation of the prosody seems to be clear but the influence of emotional prosody on the word is ambiguous.

One possible explanation of the absenceof prosodic influence on the word evaluation is that the materials used in the previous studies have been simple words. The emotional prosody is used more frequently in sentence level but rarely in a simple word in real life. The emotional valence of prosody realized in a simple word could be relatively wicker or ambiguous than the word information of emotional valence. In this case, emotional evaluation of prosody can be easily influenced by word whose emotional valence is relatively clearer. Also, the results will be difficult to be generalized to real language processing.

The present study examined this interaction with Korean sentences recorded with emotional prosody. Korean language provides an advantage to measure it because a sentence can be made with a word (predicate). That is, the subject of a sentence is often omitted in Korean language. For example, the word, "쓸쓸하다" (I am sad) is used for an independent sentence. Two experiments were conducted; In Experiment 1, participants was asked to listen to a word andevaluate the emotional valence of the word ignoring the prosody of the word and in Experiment 2, vice versa.

II. Experiment 1 and 2.

Participants. Thirty five and 29 undergraduate students at Korea University participated in Experiment 1 and Experiment 2 respectively (14 females, 21 males, mean age 21.7 years in Experiment 1 and 15 females and 14 males, mean age 22.2 years in experiment 2).

Materials. Seventy negative, 70 positive and 70 neutral words were selected and evaluated for emotional valence on a 7-point scale ranging from 1 for very negative to 7 for very positive. In this full, we selected 23 words per condition according to the scores of emotional valence. The mean score of 23 negative, neutral and positive words were 2.8, 4.4, and 5.6 respectively. Word frequency and word length (all words had 4 syllables) across emotional conditions were controlled.

Procedure and designs. Participants were seated in a chair facing a computer monitor at a distance of about 80 m and asked to evaluate the emotional valence of sentences in ignoring the prosodic information in Experiment 1 and that of prosody in ignoring the sentence meaning in Experiment 2. Stimuli werepresented as followed sequence in a trial: A fixation point on computer monitor and a simple sound that give notice participants of the target presentation were presented at the

same time for 1000ms. Immediately after fixation point and the simple sound, the targets were presented until participants responded to the target. A response key box used for measuring RTs (response times). A half of Participants pressed '1' for 'negative' and '5' for 'positive' response and the others pressed the keys inversely.

The procedure of Experiment 1 was the same as that of Experiment 2 and participants conducted a total of 138 trials after 6 practice trials. Experiment 1 consisted of 23 negative and 23 positive words recorded by three types of prosody (negative, neutral, and positive) and Experiment 2, 23 negative, 23 neutral, and 23 positive word recorded by two types of prosody (negative and positive). These experimental designs were made for using only two response key and simplifying responses.

III. Results

For the analysis of response latency, incorrect RTs and the correct RTs below 300ms or above three standard deviations were excluded. Figure 1 shows mean RT as a function of emotional meaning of sentence and prosody. The remaining data were submitted to a two-way analysis of variance (ANOVA) resulting from the factorial combination of emotional valence of word (positive and negative) and prosody (positive, neutral, and negative). Because the emotional words and prosodydiffered in auditory length of the stimulus recording despite being matched on number of syllables, the item analysis (F2) was designed to take differences in auditory length into account. This was done by performing an analysis of covariance (ANCOVA) on the item means using stimulus length of each item as a covariate.

Experiment 1(prosodic influence on word evaluation).

The latency analysis exhibited significant main effects of emotional valence of word, [F_1 (1, 34) = 59.81, $p < .0001$, F_2(1, 131) = 24.20, $p<.0001$] and emotional valence of prosody, [F_1 (2, 68) = 6.96, $p<.01$, F_2 (2, 131) = 1.99, p = ns]. Participants evaluated the emotional valence of words more rapidly when the lexical level of word was positive (907ms) than when negative (972ms) and when the emotional prosody is negative (936ms) than when neutral or positive (957ms and 962ms, respectively). The main effect of the auditory length of stimuli (covariance) was not significant, [F_2 (1, 131) = .00, p = .99]. There was a significant interaction between emotional valence of word and prosody, [F_1 (2, 68) = 14.06, p =.0001, F_2 (2, 131) =6.01, $p< .01$] (see Figure 1-a). To understand this interaction, a simple main effect was analyzed. The prosodic influence across its emotional valence appeared more critically when the word was negative, [F1 (2, 33) = 16. 40, $p < .0001$, F2 (2, 132) = 7.08, $p < .001$] than when positive [F1 (2, 33) = 7.70, $p < .01$. F2 (2, 132) = 1.39, p < ns.]. On the contrary, the evaluation speed of word appeared more critically when the prosody was positive, [F_1 (1, 34) = 46.57, $p < .0001$, F_2 (1,132) = 30.90, $p <.0001$] than when neutral [F_1 (1, 34) = 21.38, $p <.0001$, F_2 (1, 132) = 4.42, $p<.05$] or negative [F_1 (1, 34) = .09, p=ns. F_2 (1, 132) = .94, p=ns.].

Experiment 2 (word influence on prosodic evaluation).

There was only a significant main effects of emotional valence of word, [F_1 (2, 52) = 5.45, $p < .01$, F_2 (2, 131) = 9.79, $p<.0001$]. Participants evaluated faster the emotional valence of prosody when the lexical level of word was positive (990ms) than when negative (1015ms). The main effect of the auditory length of stimuli (covariance) was not significant, [F (1, 131) = .77, p = .38]. There was a significant interaction between emotional valence of word and prosody, [F_1 (2, 52) = 23.10, p =.0001, F_2 (2, 131) =33.39, p<

.0001] (see Figure 1-b). To understand this interaction, a simple main effect was analyzed. The word influence across its emotional valence appearedsignificantly in both negative and positive prosodies, [F1 (2, 25) = 6.95, p < .01, F2 (2, 132) = 8.43, p<.001 for negative prosody and F1 (2, 25) = 28.17, p <.001, F2 (2, 132) = 34.60, p< .001 for positive prosody]. The emotional evaluation speed of prosody appeared significantly when word was negative [F1 (1, 26) = 27.11, p <.001, F2 (1,132) =21.59, p <.001] or positive [F1 (1, 26) = 16.45, p < .001, F2 (1, 132) = 41.29, p <.001] but not when it was neutral [F1 (1, 26) = 1.28, p < ns., F2 (1, 132) = .27, p <ns.].

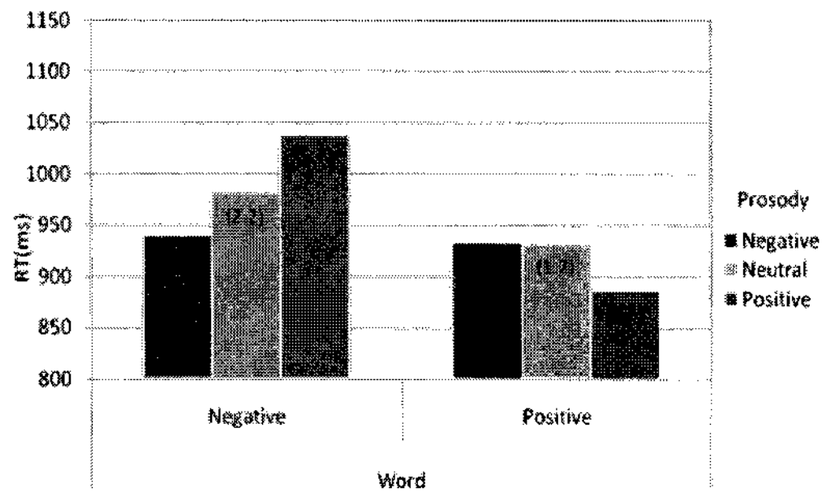

Figure 1-a

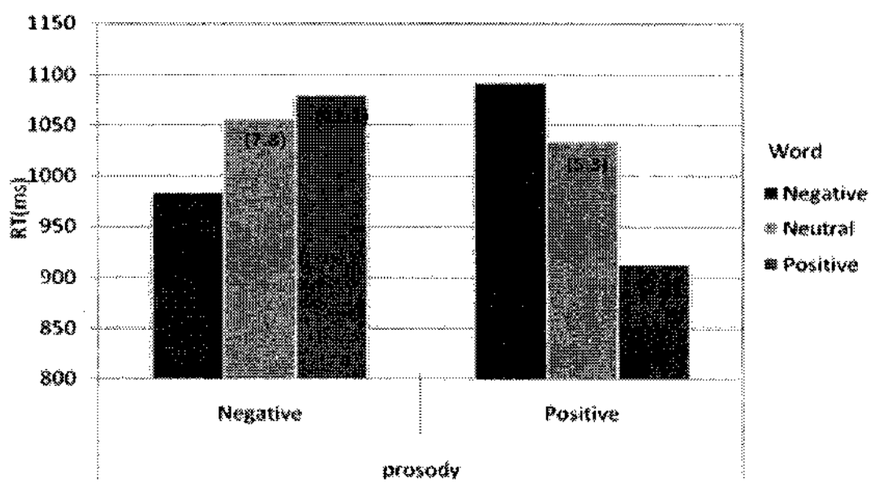

Fig. 1. The mean of RTs according to the emotional valence of sentence and prosody in Experiment 1 and 2. Figure 1-a showed the influence of emotional prosody on the word evaluation in Experiment 1 and Figure 1-b the influence of emotional word on evaluation of prosody in Experiment 2 (% error rate in parentheses).

IV. Conclusion

Figure 1 showed the interaction in both word evaluation task and prosody evaluation task. This results means that the emotional valence of prosody can affect the judgement of emotional valence of word as the word can influence on the prosodic content of emotion. When a emotional prosodic is realized in a simple word, the influence of its emotional valence on word evaluation seem to be wick but instead, when we use a sentence for expressing emotional content, the prosody is more likely to participate in judgement of emotional valence of the word. In addition, the emotional content of prosody is processed automatically and impact the meaning of the prase.

Reference

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