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Stress deafness in Tehrani and Kermani varieties of Persian

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1. Introduction

Stress deafness is the difficulty in the perception of stress in the speakers of a language which does not deal with its contrastive function (Peperkamp et al., 2010). According to stress deafness typology proposed by Dupoux & Peperkamp (2002), diverse patterns of stress deafness can be related to different phases in which infants make decisions regarding the role stress plays in their ambient language. Within the first two years of life and based on the limited amount of linguistic information, infants are required to evaluate the role of stress to set the stress parameter of their native language (Peperkamp & Dupoux, 2002). If infants discover the regular stress pattern of their ambient language, this will lead to the negative value of this parameter. In contrast, in case of no regular stress pattern, the positive value will be selected, and stress will be regarded as an essential part of the phonological representation of words in the lexicon.

Comparing stress deafness in Persian speakers with that of the speakers of Dutch, Japanese, French and Indonesian, Rahmani et al. (2015) have shown that Persian participants performed as poorly as French participants. It seems that in languages such as Persian and French the phonological representation of words is provided with their accent location within the first stages of language acquisition which serves to detect word boundaries. Nevertheless, at later stages, this type of information would not survive in the grammar of the adult speakers, and they are not able to perceive stress.

The purpose of the present paper was to replicate the perceptual study conducted by Rahmani et al. (2015) on stress deafness for the Tehrani variety of Persian, which shows the characteristics of a syllable-timed language and compare the results with those obtained from the hearers of the Kermani variety which is known as a stress-timed language.

2. Materials and method

The perceptual experiment of the present study followed the one conducted by Peperkamp et al. (2010) and later used by Rahmani et al. (2015). Professor

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Peperkamp generously shared the stimuli and instructions necessary to perform the experiment. The experiment consisted of three stages and in each stage the participants were instructed to learn two bi-syllabic CVCV non-words. In the first stage, the participants were tested on the perception of phonemic minimal pairs (/'muku/ and /'munu/) as a test of their ability to distinguish consonantal phonemes. In the second and the third stages, the perception of stress minimal pairs (/'munu/ and /mu'nu/) was tested. Two sets of stress minimal pairs were designed: in the first set, henceforth called the "durational minimal pairs", duration, F0 and intensity were the acoustic cues for stress, but in the second set henceforth referred to as the "non-durational minimal pairs", the durational differences were neutralized and only F0 and intensity were kept as stress cues. Participants included 12 male and 11 female Kermani speakers (mean age: 27.8) and 11 male and 11 female Tehrani speakers (mean age: 28.9). For more details regarding stimuli and instructions, one can consider Peperkamp et al.'s (2010) work.

3. Results and discussion

To analyze stress deafness, an individual index (error rate index) was defined which denotes the ratio of incorrect answers to total answers:

Table1. Descriptive indices for error rates of varieties and contrasts.

Variety	Contrasts	Mean	Min.	Max.	Std. Dev.
Tehrani	phonemic contrast	0.13	0	0.44	0.122
	durational stress contrast	0.316	0.05	0.51	0.143
	non-durational stress contrast	0.336	0.09	0.36	0.143
Kermani	phonemic contrast	0.101	0	0.37	0.084
	durational stress contrast	0.254	0.03	0.49	0.156
	non-durational stress contrast	0.262	0.01	0.5	0.16

As the results indicate, speakers of both varieties had considerably lower error rates in the perception of phonemic contrasts compared to stress contrasts. They also performed better in the perception of durational compared to non-durational stress contrasts. Conducting a two-way mixed ANOVA, the effect of language variety, phonemic, and stress contrasts on the error rates were calculated.

Table 2. Results of two-way mixed ANOVA for the effect of variety and contrast on error rates

Effect	NumDF	DenDF	F	p (p < (0.05))
Variety	1	35	1.257	0.27
Contrast	2	70	47.272	< 0.05
Variety × Contrast	2	70	0.459	0.634

According to the results in table 2, there is no significant effect of variety on error rate (p-value: 0.27). However, contrast type has a significant effect on this rate (p-value < 0.05). Moreover, the interactive effect of variety and contrast does not result in a significant effect (p-value: 0.634). The results of a further Bonferroni test for contrast indicated that in both varieties there was a significant difference between the performance of participants in the durational versus phonemic contrast and in the non-durational versus phonemic contrast (p-value < 0.05). The difference between durational versus non-durational contrast was not significant.

Table 3. Results of Bonferroni tests for analyzing the effect of contrasts on error rates.

Variety	Contrast type	F	DF	p-value
Tehrani	durational-non-durational	-0.605	19	0.525
	durational – phonemic	20.2	19	0 < 0.05
	non-durational - phonemic	18.5	19	0 < 0.05
Kermani	durational-non-durational	-0.303	19	0.765
	durational – phonemic	19.05	19	< 0.05
	non-durational - phonemic	15.3	19	< 0.05

Finally, another three individual stress deafness indices were defined:

a) Deafness index (1): the difference between durational and phonemic contrasts;
b) Deafness index (2): the difference between non-durational and phonemic contrasts;
c) Deafness index (2): the difference between stress and phonemic contrasts.

Regarding these indices, the results are illustrated in table 4:

Table 4. Deafness indices of Tehrani and Kermani varieties.

	Tehrani	Kermani
Deafness index (1)	20.2	19.05
Deafness index (2)	18.5	15.3
Deafness index (3)	29.7	18.4

The results indicated that in all of the cases, the deafness indices of Tehrani participants are higher than those of Kermani participants.

4. Conclusion

Despite different rhythmic patterns of Tehrani and Kermani varieties of Persian, no significant difference was detected between the performance of their subjects in the stress deafness tests performed in this research. In each variety, compared to the stress minimal pairs, the subjects significantly outperformed in the perception of phonemic minimal pairs, which provides evidence for stress deafness. In addition, no significant difference was observed between durational and non-durational stress minimal pairs. F0 alternations indicated no significant effect on the perception of stress minimal pairs either. In their study, Rahmani et al. (2019) regarded Persian, French, and Hungarian as languages which have fairly strong stress deafness. But considering stress deafness typology (Dupoux & Peperkamp, 2002) and stress deafness index (Peperkamp & Dupoux, 2002), the two varieties of Persian show more similarity with Hungarian. In this type of languages, clitics fall outside the stress domain, and in both phonological words and clitic groups, stress is assigned regularly to the edge of the phonological word. The formation of this type is based on the acquisition of the distinction between lexical items and functional items, in a way that lexical items fall within and functional items fall outside the stress domain. If the distinction is acquired prior to the setting of the stress parameter, stress deafness results. Based on the results, it seems that the speakers of the studied varieties have acquired this distinction prior to the setting of the stress parameter, which in turn indicates their ability to detect regular stress pattern by removing unstressed syllables of clitics.

Keywords: Deafness index; Kermani variety; Persian; Stress deafness; Tehrani variety