

Native Korean Speakers' Perception on Arabic Pharyngeal Contrast¹

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Abstract

The present study examines native Korean speakers' perception of Arabic pharyngealized and non-pharyngealized contrasts in consonants. The paper shows how L1 speakers in different learning stages would accommodate L2 contrasts absent in their L1 phonology. A perception test was conducted on the participants who are native Korean speakers divided into three distinct groups depending on their familiarity with the Arabic language. At an ISI condition of 1200 milliseconds the most experienced learners of Arabic performed the worst in discriminating between the Arabic pharyngealized and non-pharyngealized consonants. It was also observed that all participants across all groups have a tendency of perceiving the pharyngeal contrasts in two distinct ways.

1. Introduction

Inability to discriminate among closely related foreign language sounds by native speakers of a particular language is not an unusual phenomenon. It has been widely reported that adults have difficulty in perceiving novel contrasts that are not available in their native phonology (Lisker and Abramson 1970, Werker and Tees 1984 etc.). On the contrary it has also been reported that infants in the first year of their life are able to discriminate between closely related speech sound contrasts (Werker et al. 1981, Werker and Tees 1984 etc.). However, the more a human is exposed to their L1; their ability to detect novel phonetic contrasts significantly decreases. The question that naturally arises here is, do adults completely lose the sensitivity for novel phonetic contrasts? Werker and Tees (1984) argues that the ability to perceive novel contrasts in L2 is not completely lost in adults. However adults do change the focus of attention resulting from the altering of hearing strategies. Hence, there might be a possibility of regaining the sensitivity for novel contrasts even in adults.

Our goal in this paper is to see how adult native speakers of the Korean language perceive and discriminate between the pharyngealized and non-pharyngealized contrasts of the Arabic phonemes. We conducted a series of perception tests on three groups of Korean speakers- novice Korean speakers who have no experience with the Arabic language (G1), Korean learners of Arabic who have studied the

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language for less than a year (G2) and Korean learners of Arabic who have more than four years of experience with the language (G3). The results of the perception tests were compared among the three groups and reported in the sections to follow. The following sections outline the methodology, results and implications derived from the current study.

2. Methodology

2.1. Stimuli

A male native Arabic speaker from Kuwait was recorded producing the pharyngealized and non-pharyngealized contrasts. The speaker was asked to pronounce the each stimulus in a C/i/ structure in Modern Standard Arabic (MSA). The C comprised of four different types of Arabic pharyngealized consonants and their non-pharyngealized counterparts: /t, t^ʕ, d, d^ʕ, ð, ð^ʕ, s, s^ʕ/. Al-Masri & Jongman (2003) reported that the pharyngealized consonants in Arabic lower the F2 of the adjacent vowels. It is also reported that the degree of F2 lowering was less in [i] or [u] than [a] vowel. Further, in Hong and Sarmah (2009) it was noticed that in the context of pharyngealized consonants [u] tended to give rise to an allophonic variant [o]. However, the vowel [i] showed minimal consonantal effect on it. As [u] and [o] might have been considered to be two separate phonemes by the native Korean participants, the decision was taken in favor of the C/□/ structures. The vowels in the stimuli had been normalized for their duration (within each pair) and for intensity (at 75dB).

2.2. Participants

Thirty one (31) native speakers of Korean participated in this study (13 male and 18 female). Their ages ranged from 19 to 35 years. They were classified into three groups according to their proficiency in Arabic. The first group (G1) consisted of native Korean speakers with no knowledge and exposure to the Arabic language. The G1 group consisted of (10) participants with a mean age of 25.5 (*SD*= 4.4). The G2 group comprised of eleven undergraduate students with a mean age of 19.9 (*SD* = 0.3) who have taken Arabic lessons for less than a year. The participants in the G3 group consisted of ten advanced learners of Arabic with a mean age of 26.1 (*SD*= 2.1). The participants in G3 have had a minimum of four year university level study in Arabic with some of them having lived in Arabic speaking countries. None of the participants reported any history of hearing or speech disorders and they reported to be in normal physical condition at the time of the study. They were compensated with a gift voucher of five thousand Won for their participation.

2.3. Procedure

An ABX discrimination test was conducted on the participants of this study where the participants heard a block of three stimuli that were organized as shown in Table 1. This type of task is highly acknowledged for its reliability in works on L2 perception (Best et al. 1988, Best and Strange 1992 etc).

Table 1. Stimuli sets used in the current study

Blocks	Stimuli Type	Stimuli Sets
I	AAB	/t-t-t ^s /, /ð-ð-ð ^s /, /d-d-d ^s /, /s-s-s ^s /
II	BAA	/t ^s -t-t/, /ð ^s -ð-ð/, /d ^s -d-d/, /s ^s -s-s/
III	BBA	/t ^s -t ^s -t/, /ð ^s -ð ^s -ð/, /d ^s -d ^s -d/, /s ^s -s ^s -s/
IV	ABB	/t-t ^s -t ^s /, /ð-ð ^s -ð ^s /, /d-d ^s -d ^s /, /s-s ^s -s ^s /

Each stimuli set was repeated six times resulting in a total of 96 trials (4 contrastive pairs x 4 trial types x 6 repetitions) given to the participants with an inter-stimulus-interval (ISI) of 1200 milliseconds. Each set was randomly presented on a laptop computer using Praat (Boersma and Weenink 2009) MFC interface. The participants listened to the sounds through a pair of headphones and once a participant finished listening to a set of stimuli, she was asked to identify the distinct phoneme by clicking a relevant option on the computer screen. Each participant took about twenty minutes to complete the experiment. Their responses were collected onto a spreadsheet and subjected to further analyses. For statistical analysis, ANOVA and Bonferroni post-hoc tests were conducted on the raw data.

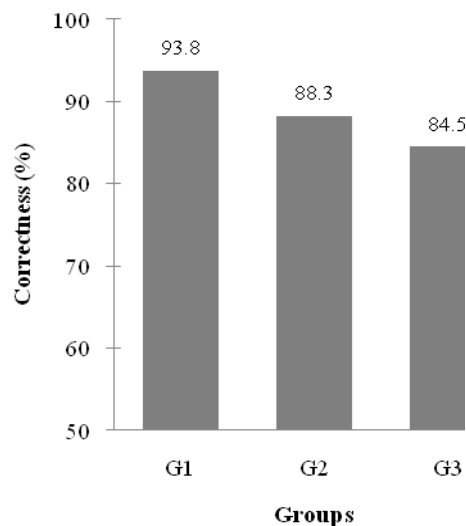
3. Results

3.1. Performance by groups

3.1.1. Between Groups

The participants across all three groups (G1, G2 and G3) showed high level of correct discrimination.

Figure 1. Overall performance of the three groups

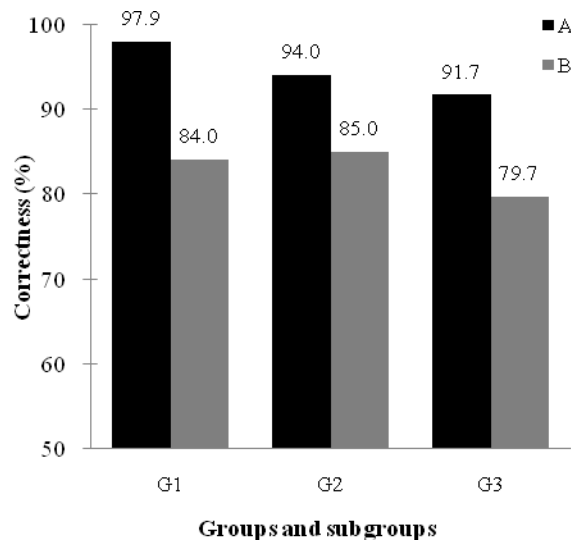


Across all groups 88.81% of responses were correct (SD= 31.52). However, as seen in Figure 1, the average correct identification of the stimuli showed a significant group effect [$F(2, 2973) = 21.28, p < 0.001$]. A Bonferroni post-hoc test confirmed that the performance of the naive group (G1) is significantly better than the experienced groups (G2 and G3) [$p < 0.001$]. Also, the experienced groups showed significant difference in correctness from each other [$p < 0.01$].

3.1.2. Within groups

When compared among the four sets of stimuli, i.e. /t/-/t^s/, /d/-/d^s/, /ð/-/ð^s/ and /s/-/s^s/, a significant difference of performance was seen in the /d/-/d^s/ and the /s/-/s^s/ sets (see section 3.2 for more details). Speakers in each group fell into two distinct categories depending on their ability to distinguish the pharyngealized vs. non-pharyngealized contrasts in the /d/-/d^s/ set. While one subgroup performed better on these contrasts almost (90% correct) the other performed below the 65% correctness mark on the /d/-/d^s/ contrasts. Hence, we divided the data into two subgroups A and B. Subgroup A consisted of participants who had less difficulty in discriminating the /d/-/d^s/ contrasts while subgroup B consisted of participants who had more difficulty in perceiving the /d/-/d^s/ contrasts. An ANOVA test confirmed that the performance of subgroup A [$\bar{x}=95.21, SD=21.36$] was significantly different than that of subgroup B ($\bar{x}=82.81, SD=37.73$) [$F(1, 2974) = 119.45, p < 0.001$].

Figure 2. Performance by subgroups of the three groups

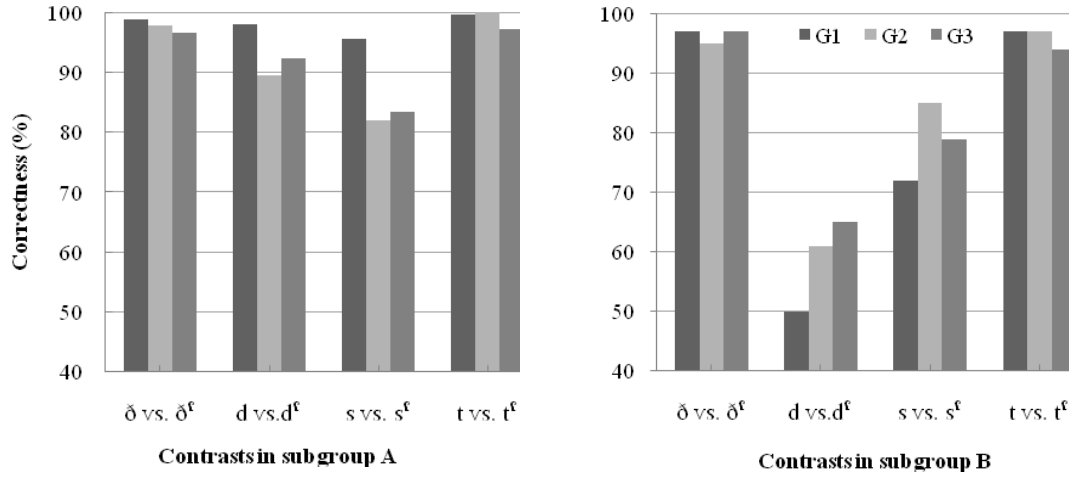


In the subgroup A, there were significant differences among the three groups in terms of their correctness in distinguishing the pharyngealized and non-pharyngealized contrasts [$F(2, 1437) = 11.44, p < 0.001$]. A Bonferroni test confirmed that within subgroup A, G1 performed significantly better than the experienced groups ($p < 0.01$) while the performance of G2 was not significantly different from that of G3 ($p > 0.02$). For subgroup B, performance of G1 does not differ significantly from G2 ($p > 0.017$), but the performance of G2 and G3 differ significantly ($p < 0.01$). Also, the performance of G1 and G3 was significantly different ($p < 0.01$).

3.2. Performance by contrasts

Performance of the four contrasts across the groups was significantly different [$F(3, 2972) = 97.34, p < 0.001$]. A post-hoc Bonferroni test indicated that the correctness in perceiving the /t/-t^h/ contrasts did not differ significantly from the correctness in perceiving the /ð/-ð^h/ contrasts ($p > 0.017$). However, the correctness scores of /t/-t^h/ and /ð/-ð^h/ contrasts differed significantly from the /d/-d^h/ and the /s/-s^h/ contrasts.

Figure 3. Performance by four different contrast types



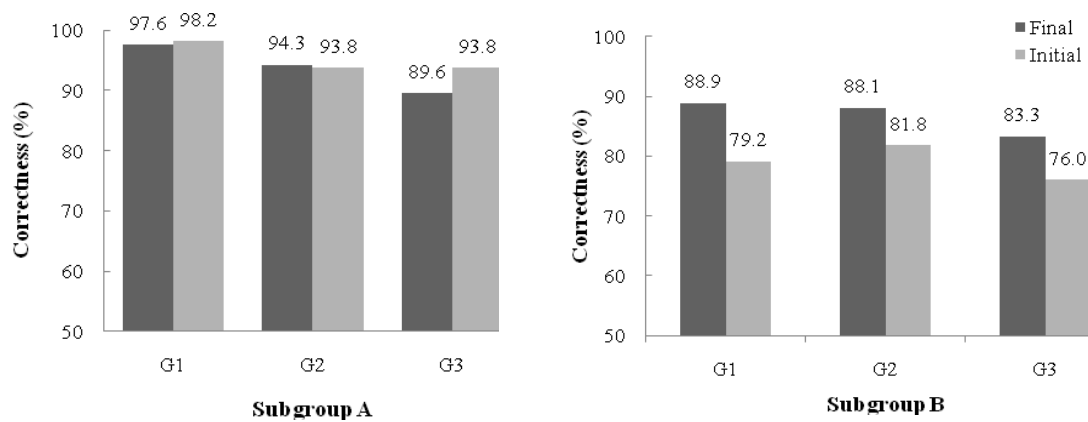
As mentioned in the previous section, responses from the participants were further divided into two subgroups namely, A and B. The performance of these two subgroups is shown in bar graphs in Figure 3. In Figure 3 it is noticed that the participants in subgroup A received the lowest correctness scores on the /s/-/sʰ/ contrasts while the participants in subgroup B received the lowest correctness scores on the /d/-/dʰ/ contrasts. A one-way ANOVA conducted to compare the performance of the subgroups indicated that there was no group effect in the correctness scores for the /t/-/tʰ/ contrasts [$F(5, 738) = 1.78, p > 0.05$]. For the /ð/-/ðʰ/ contrasts, only G1 and G3 subgroups showed significant difference [$p < 0.017$].

However, performance on the /d/-/dʰ/ contrasts revealed a significant between groups effect [$F(5, 738) = 34.36, p < 0.05$]. The correctness score for subgroup A and subgroup B differed significantly, however, within a subgroup, there was no significant difference [$F(1, 742) = 158.56, p < 0.05$]. This was also the case for the /s/-/sʰ/ contrasts, where it showed significant difference among groups [$F(5, 738) = 7.347, p < 0.05$] caused by the significant difference between the two subgroups [$F(1, 712) = 12.78, p < 0.05$].

3.3. Performance by the Target Stimulus Place

The effect of the target stimulus place on the performance of the participants was analyzed- depending on whether the target stimulus occurs initially (as in the ABB and BAA type of trials) or finally (as in the AAB and BBA type of trials).

Figure 4. Performance by target stimulus places



The participants performed better on the sets where the target stimuli occurred in the final position ($\bar{x}=90.39$, $SD=20.9$) than in the ones where they occurred in the initial position ($\bar{x}=87.23$, $SD=23.1$). However, an ANOVA test confirmed that this difference in correctness is not significant ($p > 0.05$). The correctness scores were then compared by the two subgroups- A and B (see Figure 3), it was noticed that in subgroup A, there was no significant effect of target stimulus place on the correct responses ($p > 0.05$); whereas in subgroup B target place did have an effect on performance ($p < 0.05$).

4. Discussion

The current study showed that native speakers of Korean perceive the Arabic pharyngealized-non-pharyngealized distinction differently, based on their proficiency level in Arabic. The conclusions drawn from the results are discussed in the following subsections.

4.1. The naive group performs better

Among the three groups of Korean native speakers that participated in this experiment, it was noticed that the participants from the naive group (G1) was significantly better than the two experienced groups (G2 and G3) in discriminating the pharyngealized and non-pharyngealized contrasts in Arabic. Again the two experienced groups did not differ significantly in distinguishing the said contrasts. Even though this result seems to be counter-intuitive, it can be explained that the listeners in the naive, inexperienced group are probably using some kind of “phonetic mode” processing in discriminating the contrasts in Arabic.

Werker and Tees (1984) showed that the inexperienced speakers could discriminate among non native contrasts when the ISI was 500-ms however; their ability to correctly distinguish among the non-native contrasts was limited by a 1500-ms ISI. They suggested that at 1500-ms of ISI, the “phonological mode” of processing was initiated whereas at the 500-ms ISI their “phonetic mode” of processing was initiated. They also suggested that at the “phonetic mode” of processing the linguistic experience of the speakers would not influence their ability to discriminate among non-native contrasts. Burnham and

Francis (1997) showed that while discriminating among some tone contrasts in Thai, the native speakers performed better in the 1500-ms ISI conditions than in the 500-ms ISI conditions.

In the current study, the ISI in the experiment was set at 1200-ms. Hence, we propose that even though the experienced speakers of the Arabic language want to implement a “phonological mode” to process the Arabic sounds, definitely an ISI of 1200-ms is not enough for them to exploit the “phonological mode” and arrive at the correct distinction. However, the non-experienced Korean speakers would solely depend on their “phonetic mode” of processing to distinguish the Arabic phonemes- in that case an ISI of 1200-ms is enough for them to correctly distinguish between the Arabic pharyngealized vs. non-pharyngealized contrasts.

4.2. Performance on the /d/-/d^ʕ/ contrasts

The results of current experiment also suggested that there are two distinct subgroups (A and B) of participants within each group (G1, G2 and G3). Subgroup A and B differed in their performance on distinguishing the /d/-/d^ʕ/ contrasts. Subgroup B was significantly worse than subgroup A in distinguishing the /d/-/d^ʕ/ contrasts (see Figure 2). If we look at the distribution of participants that constitute these two groups (see Table 2), we notice that most of the participants in the experienced groups (G2 and G3) had difficulty in distinguishing between the /d/and/d^ʕ/ in Arabic.

Table 2: Correctness in percentage on the /d/-/d^ʕ/ contrast (number of participants)

	Subgroup A	Subgroup B
G1	98% (7)	50% (3)
G2	90% (4)	61% (7)
G3	92% (4)	65% (6)

While 70% of the naïve speakers correctly distinguished the /d/ from the /d^ʕ/ with above 90% correctness scores, only 38% of the experienced speakers could do so with a correctness score of 90%. In other words, it is noticed that the more the Korean speakers’ get experienced with the Arabic language, the more difficult it is for them to tease apart the /d/-/d^ʕ/ distinction in the language. Again, as mentioned in the previous section, the experienced speakers inability to discriminate the /d/-/d^ʕ/contrast can be attributed to their attempt at processing the difference adopting a “phonological mode”. However, it would not explain why the /d/-/d^ʕ/ category stands out distinctly among the contrasts the experienced learners fail to distinguish.

4.3. Effect of the target stimulus position

The current study showed that the place of the target stimuli (the odd stimuli) does have an effect in correctly distinguishing a pharyngealized consonant from its non-pharyngealized counterpart. While participants in the subgroup A did not show any such effect, the participants in subgroup B showed a significant effect of the position of the target stimuli. In case of subgroup A, the participants in the G1 and G3 groups performed marginally better when the target stimuli occurred in the initial position in the trial sets. However, in case of subgroup B, participants in all three groups performed better when the target stimuli appeared in the trial final position. This can be due to the participants' inability to retain (and subsequently adopting the "phonological mode") the information in the trial sets due to the short ISI of 1200-ms.

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