

Chapter 4

Results

Using VOT is very important when one wants to study second/foreign language accent. Ferrand (2007, p. 267) stated that speakers in every language rely on this specific feature to classify a part as voiced or voiceless. Ladefoged (2003, p. 94) highlights the significance of the VOT claiming that any phonetic structure description of a language should contain VOT. Evidence shows that Somali speakers have problems with specific stop consonants, but are fine with others.

Yavas (2011) defined VOT aerodynamically and articulatorily as the length of the period of time between the plosive release and the starting point of vocal fold vibration. The nature and amount vibration is proportional to the glottis configurations in period of particular sound articulation. Voiced sounds appear when the vocal cords come together and the molecules of air that cross the glottis makes them vibrate.

Concerning voiceless sounds, the vocal cords are apart from each other, so the molecules of air pass without making any vibration. It can be shown by concentrating on how the segments are pronounced in word <cat>. While producing consonant [k], the vocal folds are apart, so that air passes through the glottis without obstacles. But, for [a] it is not the same during the articulation when vocal folds come together very close and the air that passes through causes vibration. For the [t] pronunciation, the vocal folds move apart, and the air passes through without making any vibration. The VOT for a [k] sound is considered to be the time lag when the articulators come further apart and the vocal cords begin vibrating. One can easily notice this acoustic behavior on spectrograms. The VOT calculations are in milliseconds, with “ms” abbreviation.

Table 4 provides some basic sociometric information about the participants. Generic

Somali names were used in the study to conceal the participant identity. The participants reported the fact that Somali was their primary language and described themselves as bilingual English-Somali speakers.

	Age Group	
	Under 17	Over 17
	Mean (SD)	Mean (SD)
Demographics		
Current Age	23.70 (3.37)	32.10 (8.31)
Age of Arrival	5 (10%)	12 (24%)
Length of Residency	34 (68%)	33 (66%)

Note. SD = Standard Deviation. All variables were measured in years.

Table 4. Descriptive Statistics of Participants' Demographics

The participants were asked to produce words (each participant pronounces a word) in their citation forms which contain the elements of [p, b, t, d, k, g] in initial position. The results were recorded and are reflected in Table 5:

Stop Consonants	Group		<i>t</i> (<i>p</i>)
	Under 17	Over 17	
	M (SD)	M (SD)	
/p/	61.13 (22.62)	39.23 (24.95)	2.06(.055)
/b/	11.90 (5.05)	12.27 (3.41)	0.19(.851)
/k/	75.60 (15.57)	67.20 (6.87)	1.56 (.136)

/g/	11.73 (7.53)	17.60 (6.49)	1.87 (.078)
/t/	63.97 (18.0)	61.73 (18.4)	.274 (.787)
/d/	11.00 (4.39)	10.77 (2.33)	.149 (.884)

Note. M = Mean. SD = Standard Deviation. t = t -score, p = significance level. All t -tests met

the Levene's test for equality of variance.

Table 5. Independent Samples T-test Comparison of VOT and Stop Consonants by Age Group

The Table above shows that only /p/ and /g/ elements indicate a marginal significant for the p values whereas /b/, /k/, /t/ and /d/ segments reflects contrary results with insignificant p value.

The correlation test Table shows that the highlighted values revealed significant predictor. For one thing, for the segment /p/, age of arrival (AOA) showed significant predictor. Also for the segment /k/, AOA indicated significant predictor. For the segment /t/, length of residency (LOR) also showed significant predictor. Insignificant predictors were revealed for the segment /b/ and /g/ - AOA and the segments /b/, /k/, /g/ - LOR.

		/b/ Mean	/p/ Mean	/k/ Mean	/g/ Mean	/t/ Mean	/d/ Mean	AOA	LOR
/b/ Mean	Pearson Correlation	1	-.049	.162	-.217	.104	-.122	.062	-.278
	Sig. (2-tailed)		.837	.496	.358	.664	.607	.794	.235
/p/ Mean	Pearson Correlation	-.049	1	.384	.027	.660**	-.126	-.665**	.365
	Sig. (2-tailed)	.837		.095	.911	.002	.598	.001	.114
/k/ Mean	Pearson Correlation	.162	.384	1	-.369	.305	-.500*	-.449*	.320
	Sig. (2-tailed)	.496	.095		.109	.191	.025	.047	.169
/g/ Mean	Pearson Correlation	-.217	.027	-.369	1	.325	.249	.279	-.125
	Sig. (2-tailed)	.358	.911	.109		.162	.290	.234	.599
/t/ Mean	Pearson Correlation	.104	.660**	.305	.325	1	-.304	-.286	.596**
	Sig. (2-tailed)	.664	.002	.191	.162		.192	.222	.006
/d/ Mean	Pearson Correlation	-.122	-.126	-.500*	.249	-.304	1	.062	-.396
	Sig. (2-tailed)	.607	.598	.025	.290	.192		.794	.084
AOA	Pearson Correlation	.062	-.665**	-.449*	.279	-.286	.062	1	-.324
	Sig. (2-tailed)	.794	.001	.047	.234	.222	.794		.163
LOR	Pearson Correlation	-.278	.365	.320	-.125	.596**	-.396	-.324	1
	Sig. (2-tailed)	.235	.114	.169	.599	.006	.084	.163	
** Correlation is considered to be significant at the 0.01 level (2-tailed).									
* Correlation is considered to be significant at the 0.05 level (2-tailed).									
N = 20 for all correlations.									

Table 6. Correlation Test

A stepwise linear regression analyses were also used to further test if age factors significantly predicated the stop consonants VOT. With this in mind, the voiced consonants /b/, /g/, and /d/ were not produced, as no significant predictors were found for these variables.

Regression Test

For /p/, a significant model was found and indicated that one predictor explained 41.2% of the variance ($R^2 = .44$, $F(1, 19) = 14.29$, $p = .001$). It was revealed that age of arrival significantly predicted VOT for /p/, $\beta = -2.46$, $t = -3.78$, $p = .001$.

For /t/, a significant model was found and indicated that one predictor variable explained 31.9% of the variance ($R^2 = .36$, $F(1, 19) = 9.90$, $p = .006$). It was revealed that length of residency significantly predicted VOT for /t/, $\beta = 1.79$, $t = 3.15$, $p = .006$.

For /k/, a significant model was found and indicated that one predictor explained 41.2% of the variance ($R^2 = .20$, $F(1, 19) = 4.55$, $p = .047$). It was revealed that age of arrival significantly predicted VOT for /k/, $\beta = -.805$, $t = -2.13$, $p = .047$.

VOT of [p] and [b]

The segment analysis follows the same pattern and logic. Articulation place is taken into account while analyzing the VOT of the contrasting stop segments.

The spectrograms in Figures 1 and 2 represent Mona’s pronunciation of [p] and [b]:

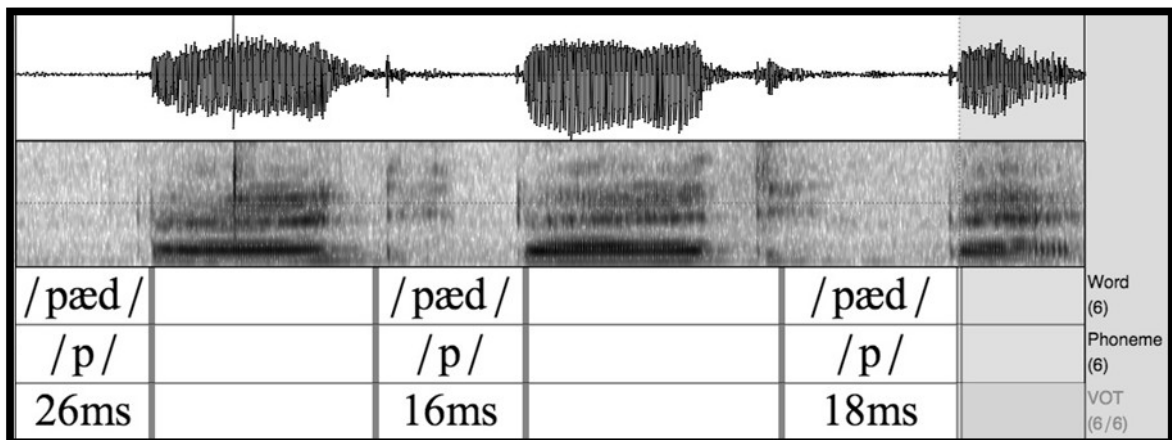


Figure 1: VOT of [p]

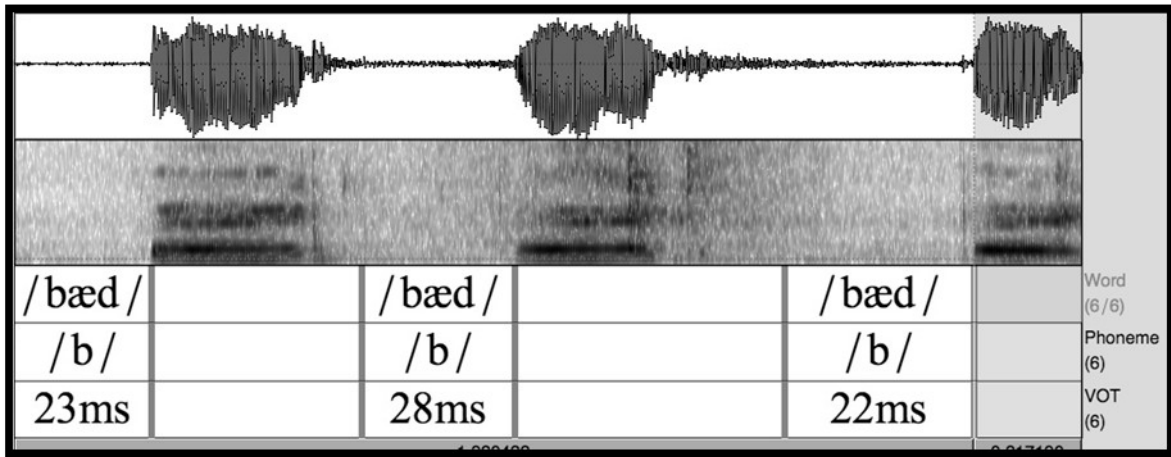


Figure 2: VOT of [b]

Figure 3 & 4 provide us with graph summaries of the VOT measurements for all 60 tokens containing [p] and [b] for both groups:

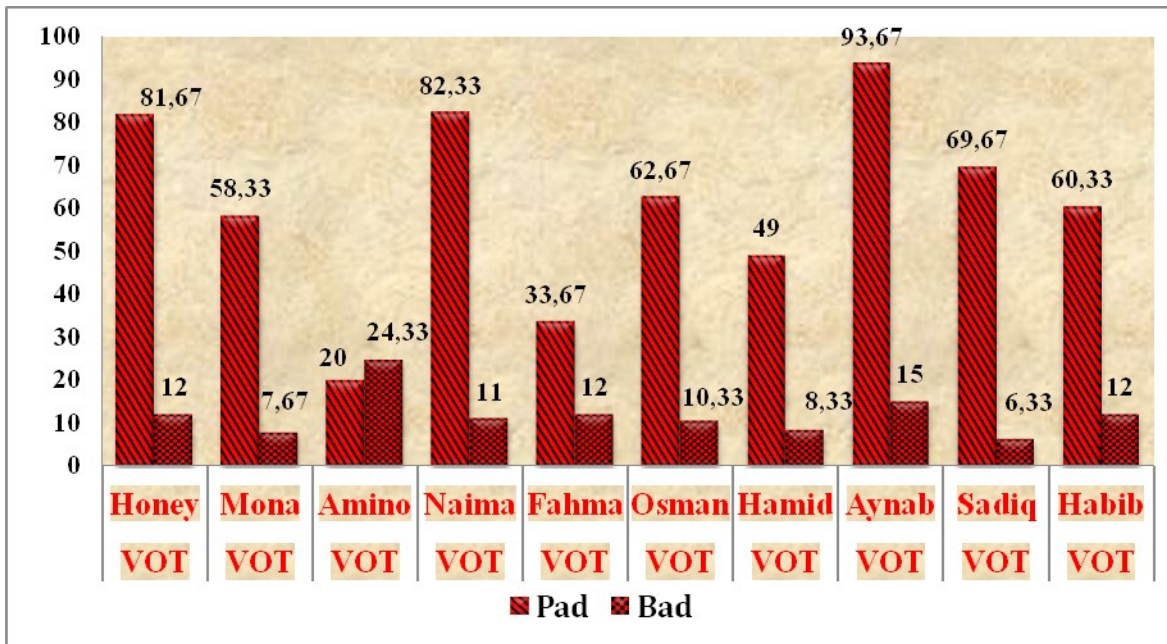


Figure 3: Under 17 VOT Data for [p] and [b]

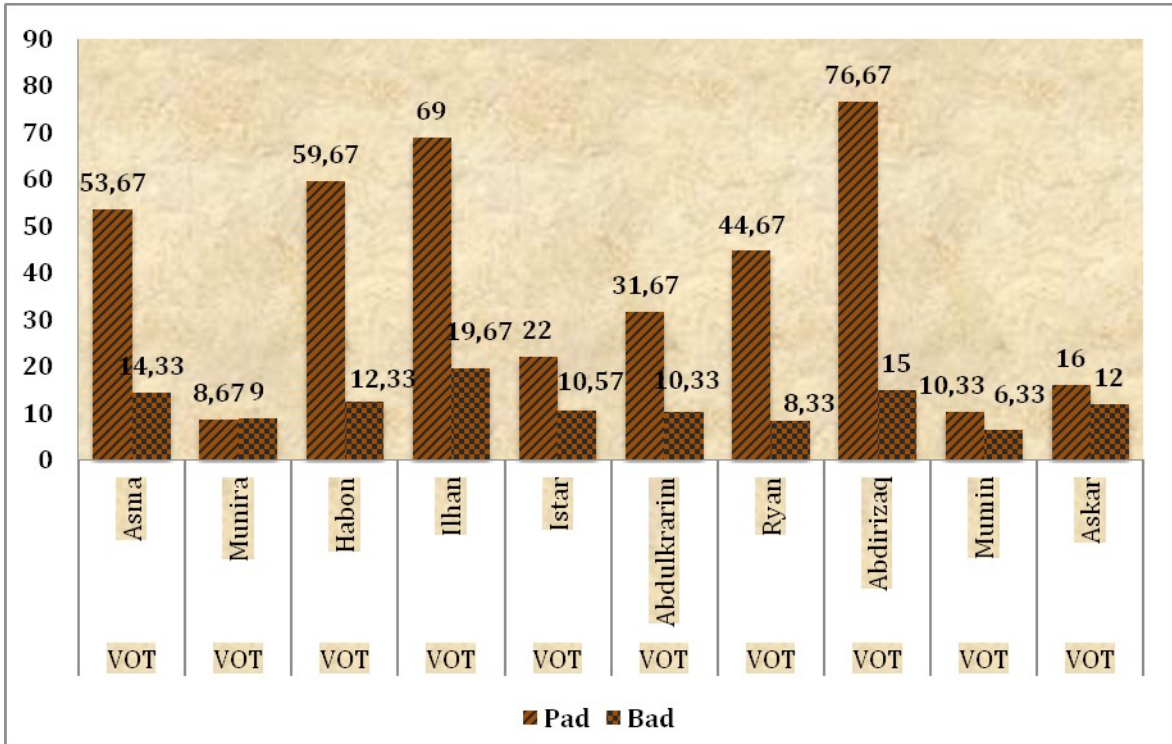


Figure 4: Over 17 Group VOT Data for [p] and [b]

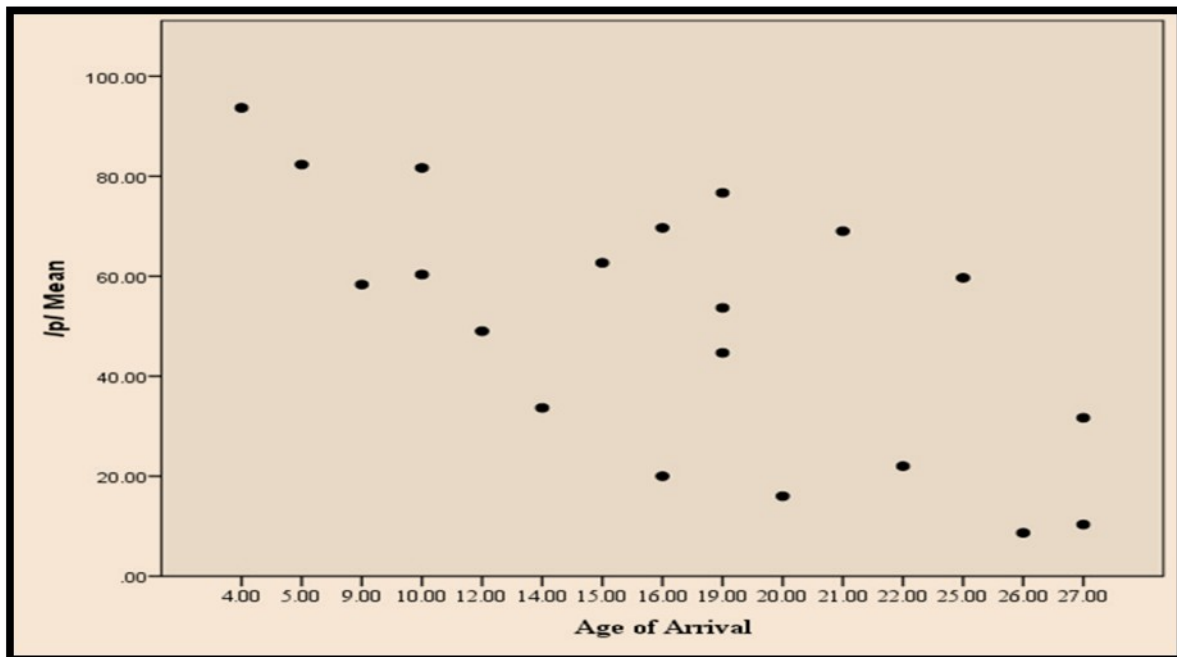


Figure 5: All-inclusive VOT Data for [p]

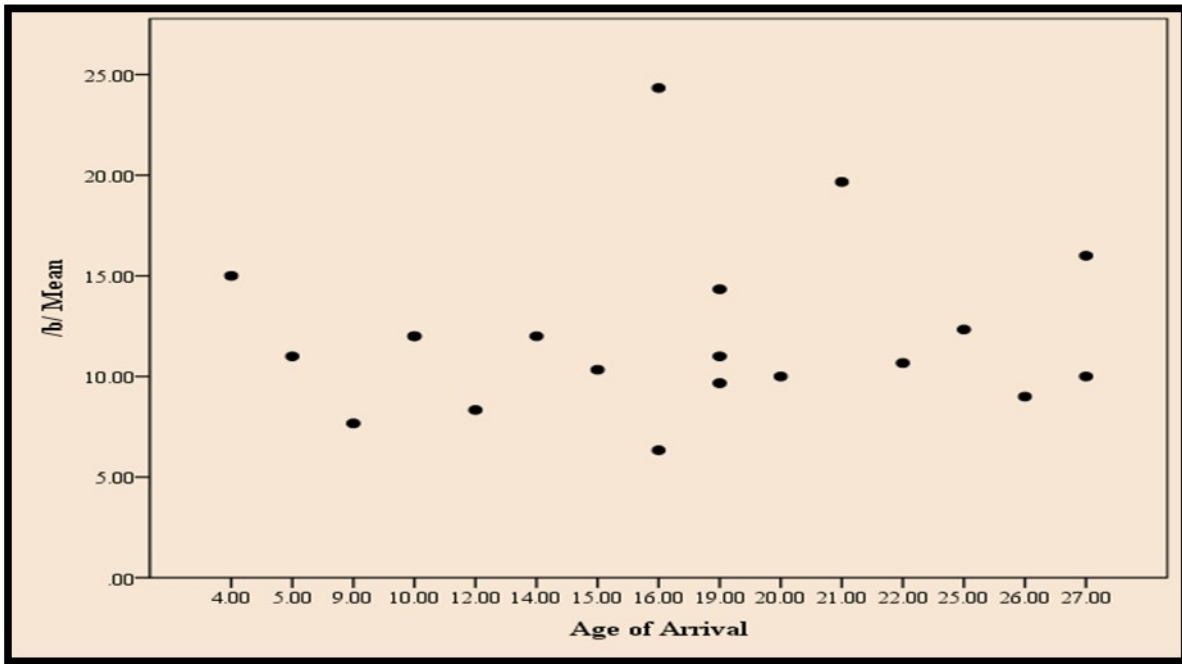


Figure 6: All-inclusive VOT Data for [b]

The mean VOT of [p] across all participants is 75.13ms for those under 17 and 39.2ms for those over 17 whereas that of [b] is 11.9ms for the first age group and 11.8ms for the second one. Hence, there is a significant difference between the mean VOT of [p] across the participants of the mentioned age groups. The mean VOT also shows that the Somali speakers do not face any difficulty differentiating both elements.

The mean VOT difference for the participants under 17 is +63.23ms and for those over 17 – 27.4ms. This might let the researcher conclude that Somalis do not face problems with [p] and [b]. However, practice shows that Somalian students do sometimes have problems as they mishear words in the class (Amundson-Cisse, 2009, pp. 65-6).

Figure 3 shows that only one of the participant whose name is Amino has difficulties with [p] and [b] pronunciation. Also, she is the only one who immigrated to the United States at the age of 15. Others arrived long before puberty. Thus, observations are approved by Amino's data that the speech of Somalis born outside U.S. or immigrated after puberty is commonly more emphasized than immigrated before puberty Somalis.

The VOT of [t] and [d]

The spectrograms in Figures 7 and 8 are those of the initial consonants in <tad> and <dad>, respectively. The pronunciations are Habon's:

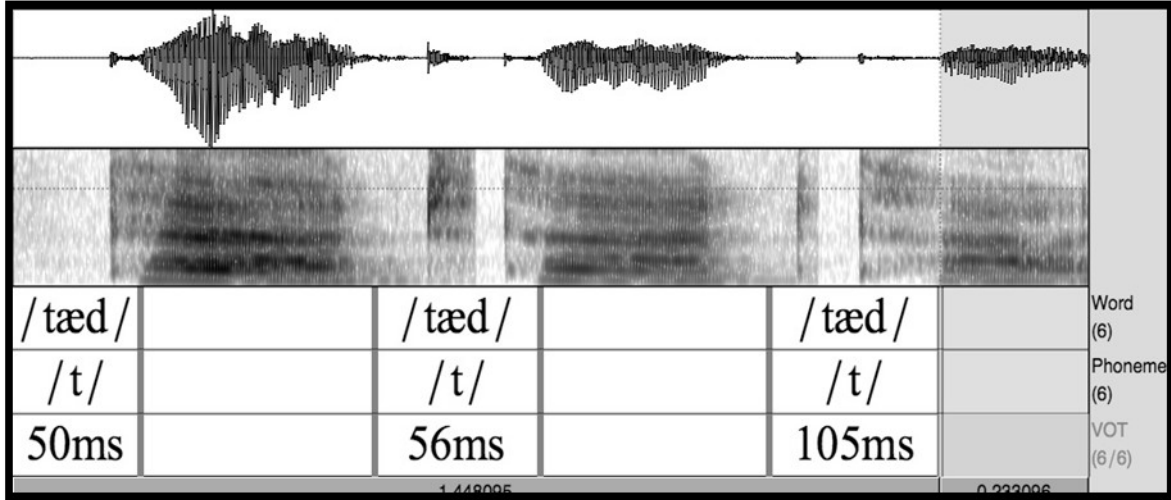


Figure 7: VOT for [t]

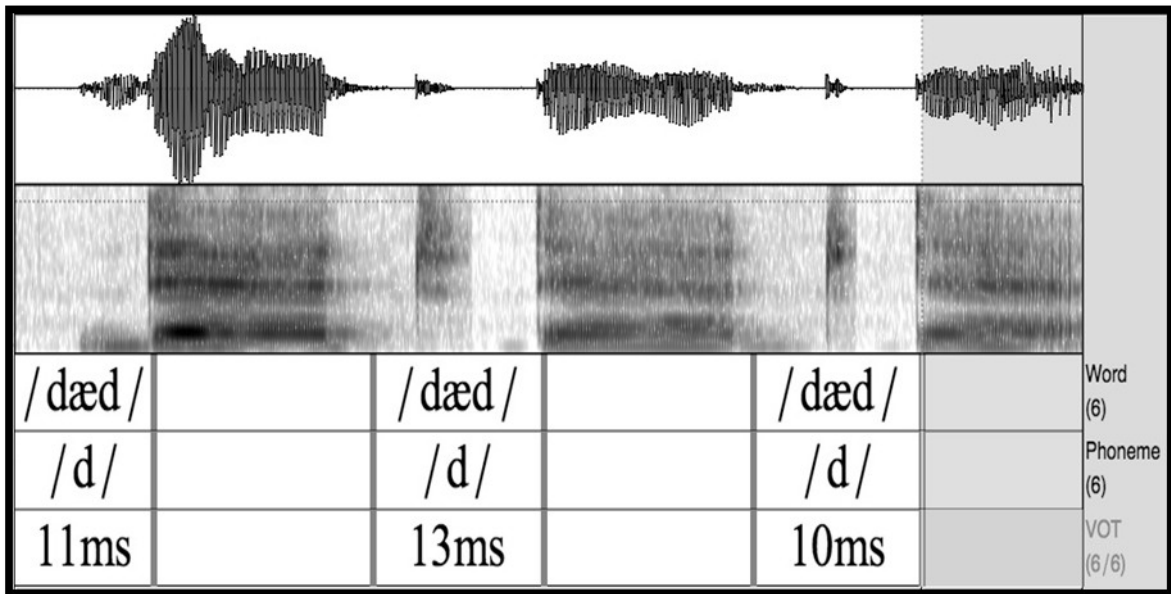


Figure 8: VOT for [d]

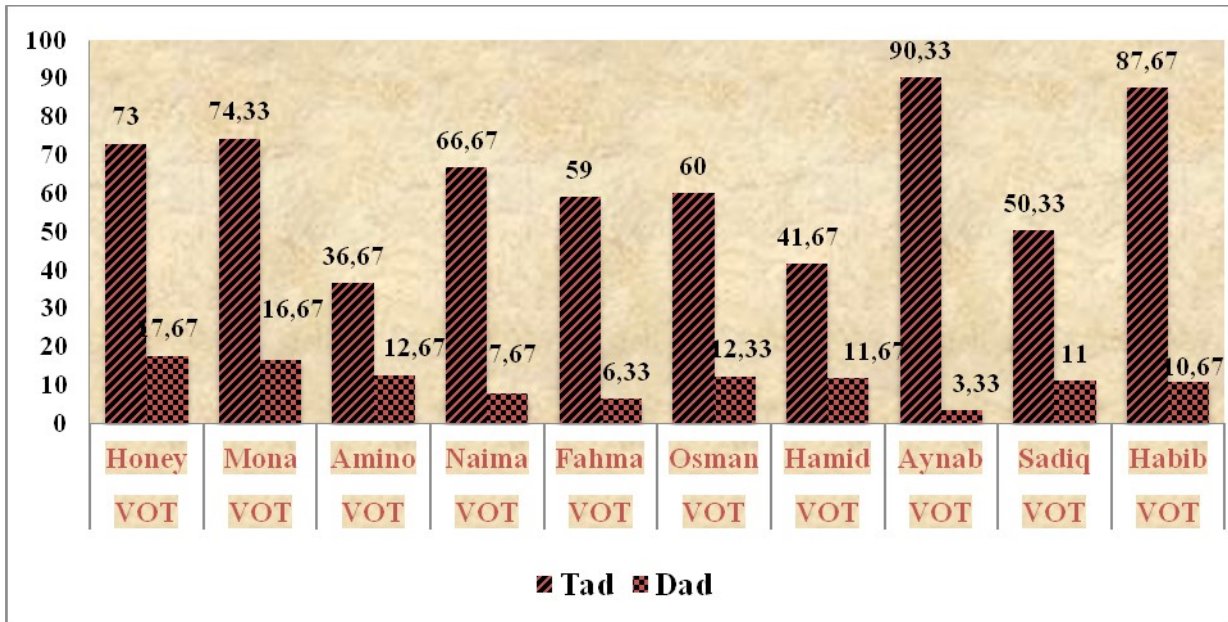


Figure 9: Under 17 Group VOT Data for [t] and [d]

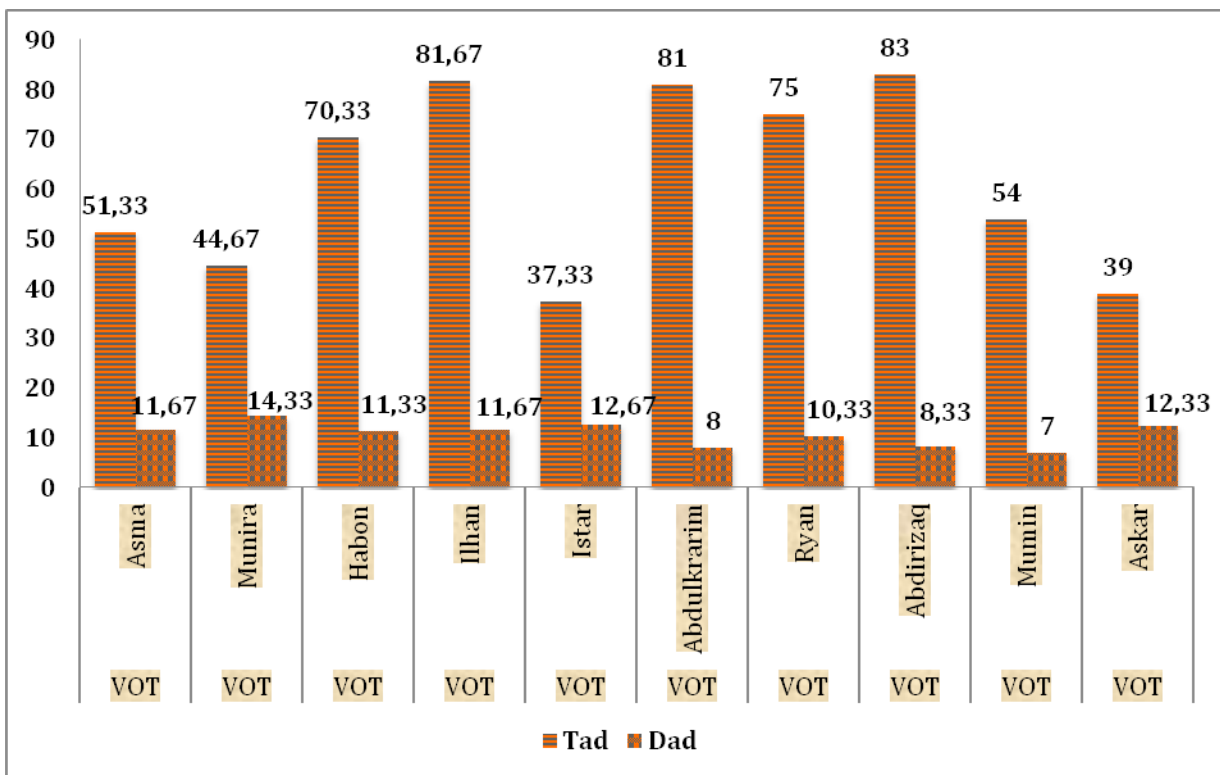


Figure 10: Over 17 Group VOT Data for [t] and [d]

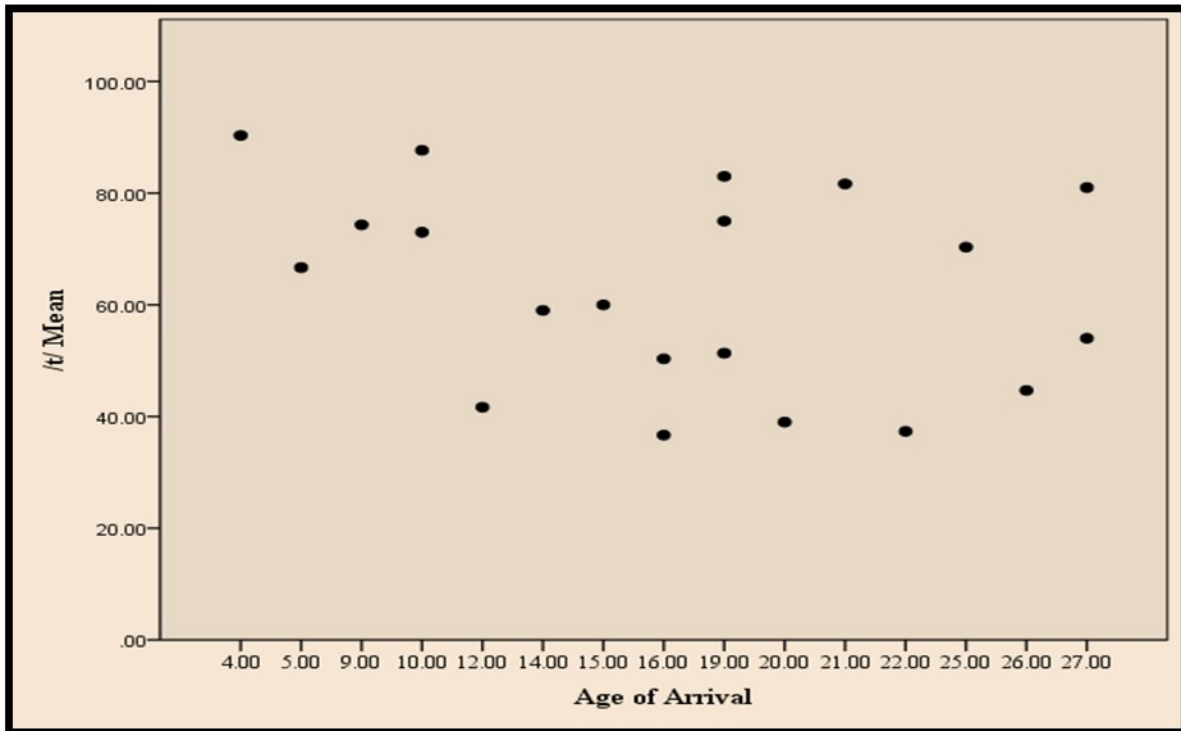


Figure 11: All-inclusive VOT Data for [t]

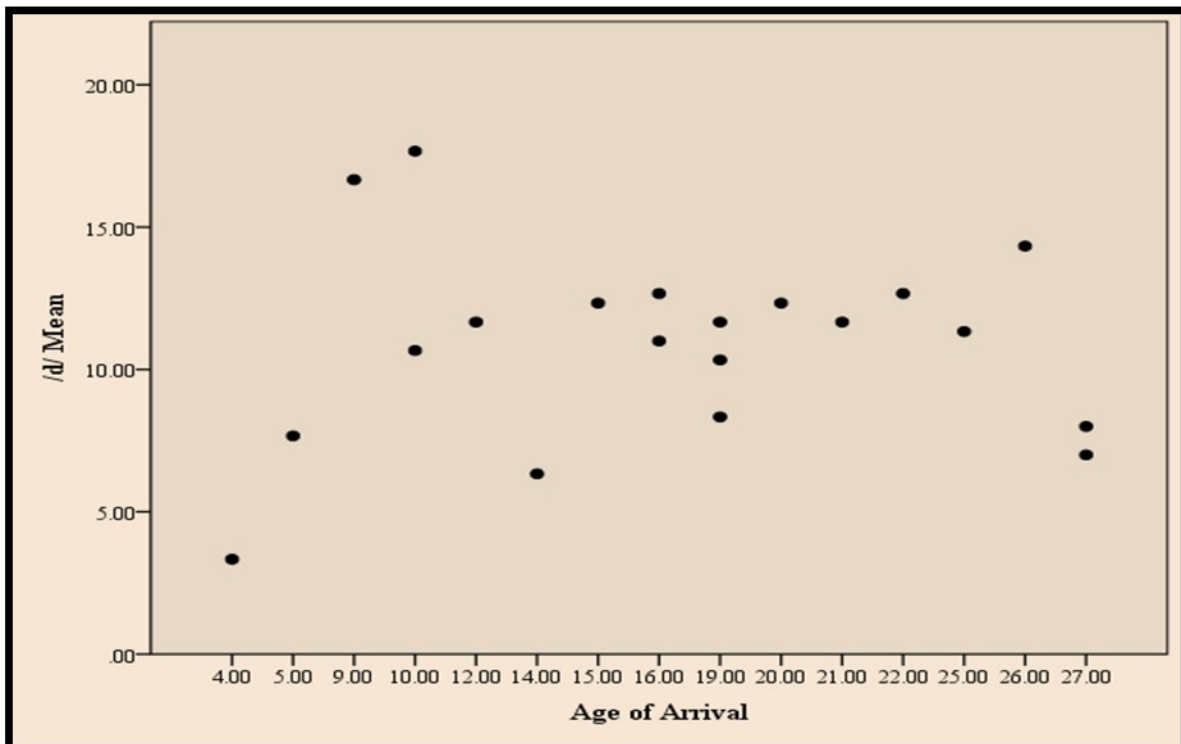


Figure 12: All-inclusive VOT Data for [d]

The VOT measurements for [t] and [d] also do not show any problems concerning pronunciation. The mean length of [t] across all participants is 64ms for those under 17 and

61.7ms for those over 17, and that of [d] is 10ms for participants under 17 and 10.77ms respectively. These measurements above indicate that Somali speakers of English do not have any pronunciation problems and make a clear distinction between voiced [d] and voiceless [t]. It was also stated that the acquisition of [d] and [t] is not affected by the participants' age of arrival.

VOT of [k] and [g]

The spectrograms in Figures 13 and 14 represent Aynab's pronunciation of [k] and [g]:

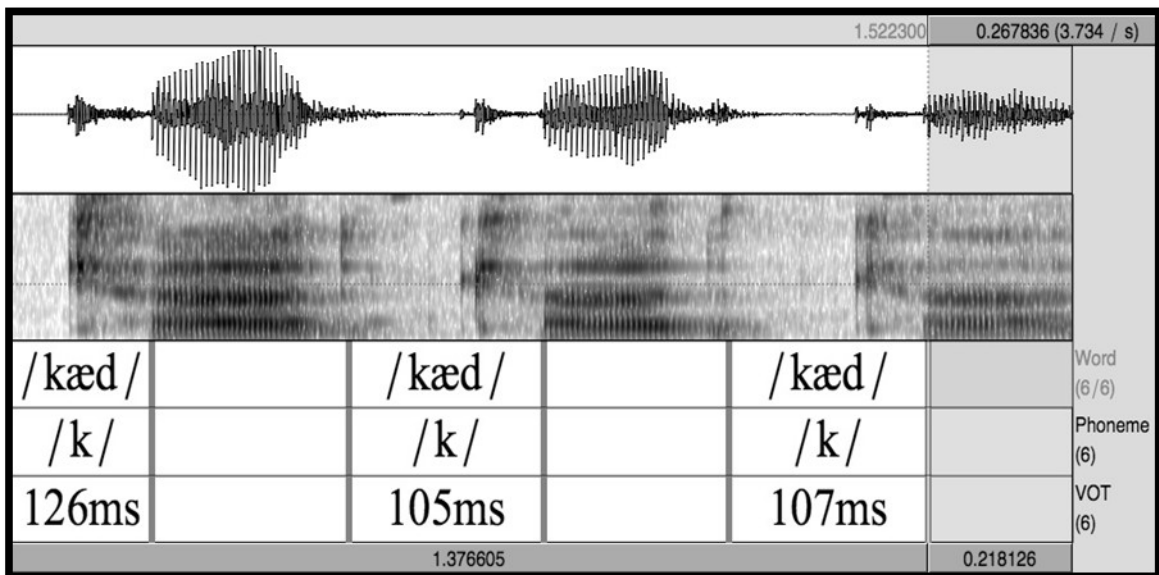


Figure 13: VOT of [k]

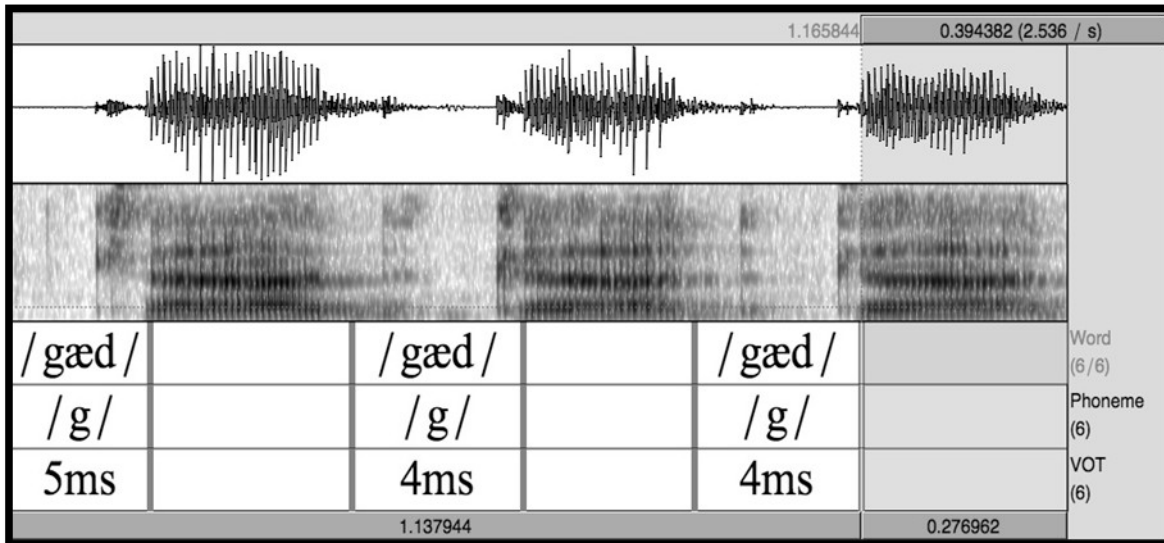


Figure 14: VOT of [g]

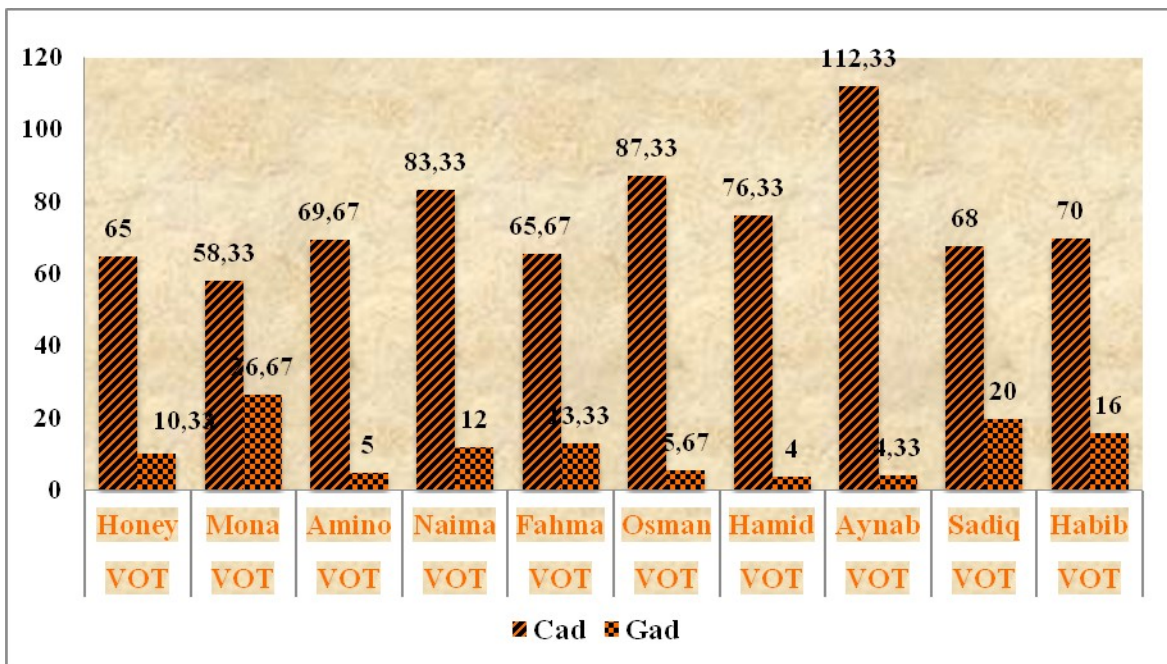


Figure 14: Under 17 Group VOT Data for [k] and [g]

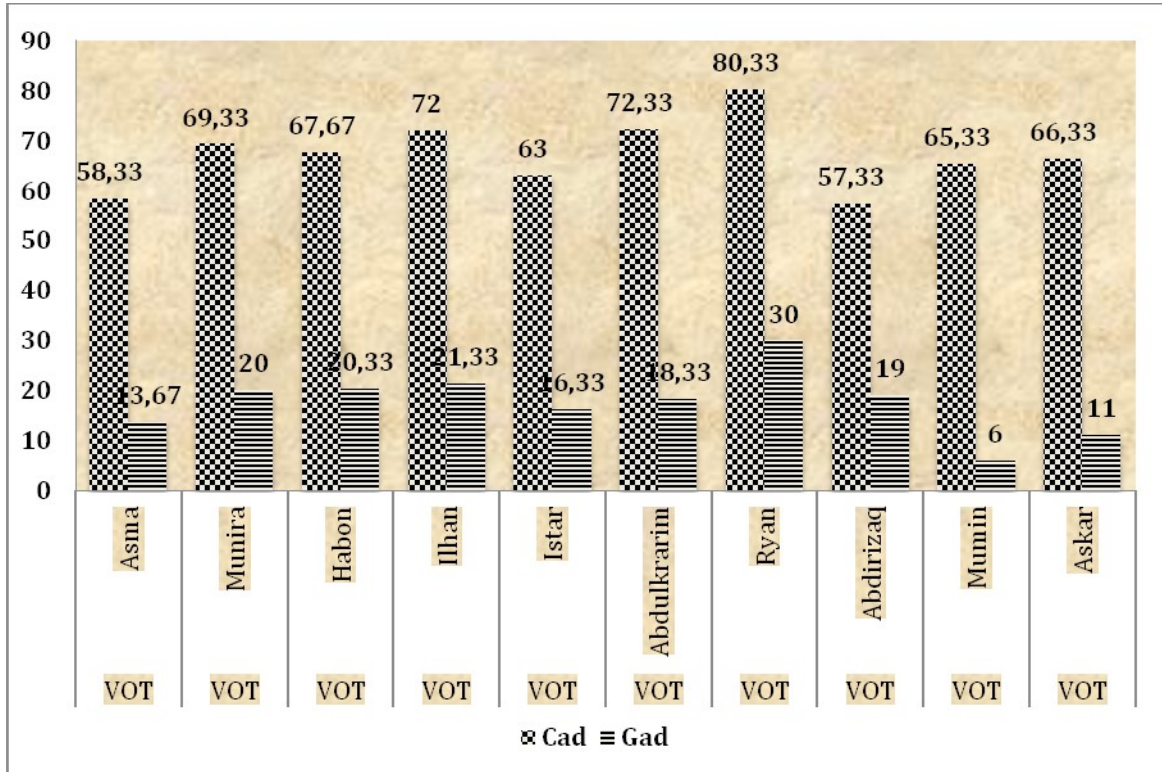


Figure 15: Over 17 Group VOT Data for [k] and [g]

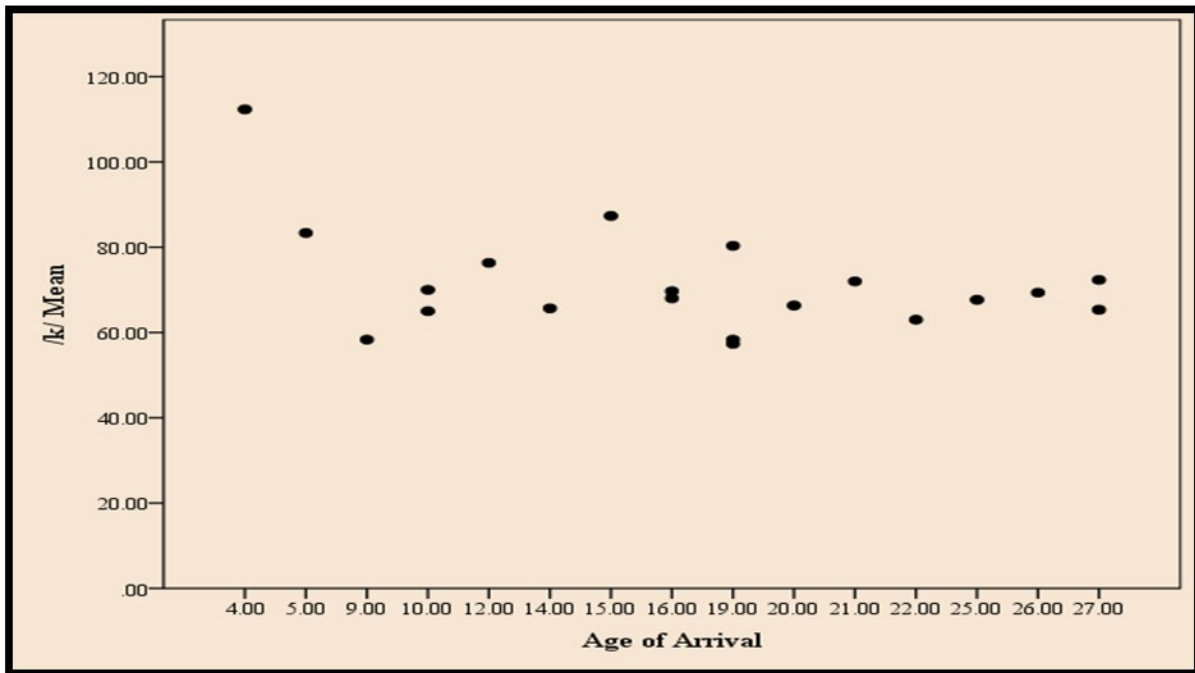


Figure 16: All-inclusive VOT Data for [k]

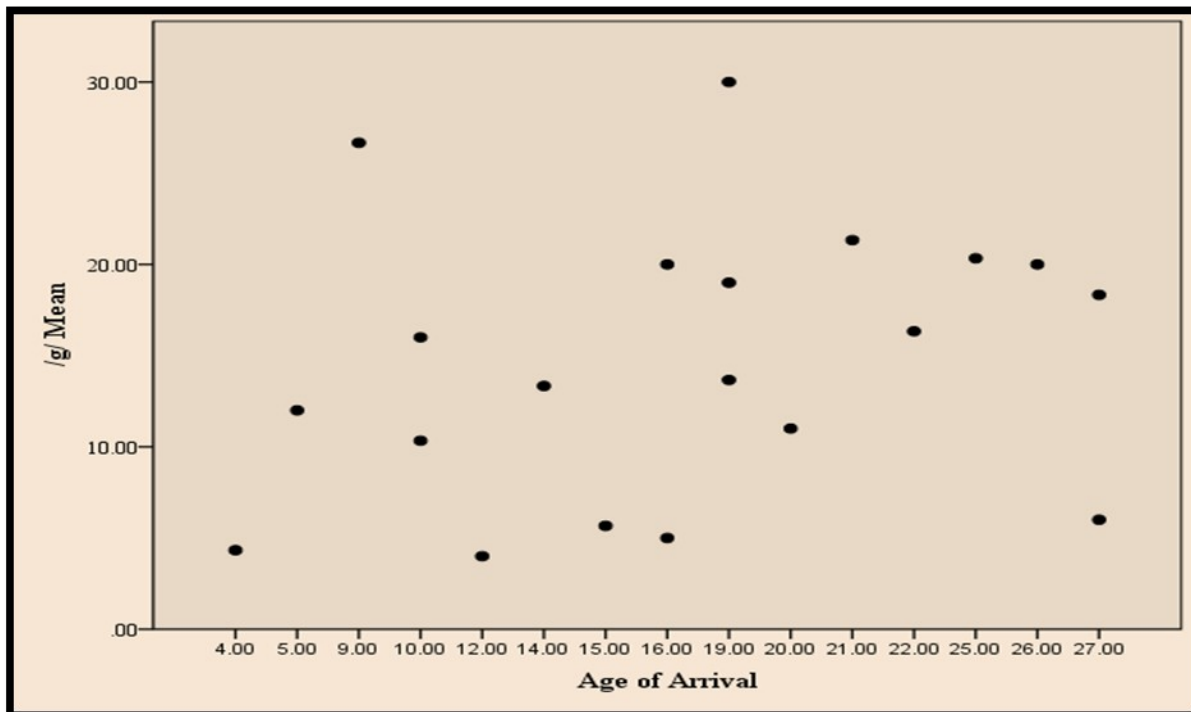


Figure 17: All-inclusive VOT Data for [g]

Consonance chart indicates that the Somali language contains velar consonants [k] and [g]. So, from the point of view of articulatory phonetics no pronunciation problems should take place for these two sounds.

The mean duration of VOT of [k] is 74.6ms for participants under 17 and 67.2ms for those over 17 whereas that of [g] is 11.73ms for the first age group and 17.6ms for the second one. The results show that speaker do perceive the voicing difference between [g] and [k] clearly. Hence, there is a conclusion that Somali speakers do not have any difficulties pronouncing the English velars [g] and [k].

In general, the ten participants produced a number of marks that included the segments [p, t, b, d, g, k]. The study shows that almost all participants had no difficulties with identifying the discussed elements. The only participant Amino heard no difference between [p] and [b]. A huge study including many speakers with Amino's linguistic profile is required to confirm if age of arrival has an influence on the [p] and [b] pronunciation.

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