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Vocal Parameters of Quranic Teachers and Regular School Teachers

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ABSTRACT

The Quranic verse reciters (QRT) use their voice for certain hours in a day to recite maximum verses as possible and regular school teachers (RT) use their voice for hours in a day for teaching purposes where both groups fall under Level II – professional voice users. The study has been done to know the vocal parameters in Quranic teachers and Regular school teachers which consist of 30 Quranic teachers, age range is age [20- 30 yrs (15) & 30-40 yrs (15)] and 30 regular school teachers, age range is age [20- 30 yrs (15) & 30-40 yrs (15)]. It aims to investigate the variations in vocal parameters (F0, jitter, shimmer and HNR). Acoustical analysis of vowels (/a:/ /i:/ and /u:/ were analyzed by using PRAAT software. The results reveal that there was significant difference in jitter /i:/ and Fo /u:/ in QRT with respect to age and there was significant difference in Fo /i:/ & /u:/, jitter /i:/ between QRT and RT with respect to age. The study concludes that there was significant difference in Fo values for all the vowel productions between QRT and RT. Hence the study confirms that QRTs are at high risk of incurring voice problems such as hyper functional voice disorders due to increased vocal load and high vocal demands.

INTRODUCTION

The human voice is extraordinary. It is capable of conveying not only complex thought but also subtle emotion. In an instant, it can communicate the terror of a scream or the beauty of a song. The importance of human voice in modern society cannot be overstated. It is the primary instrument through which most of us project our personalities and compatriots.

The professional voice users are singers, actors, teachers, receptionist, politicians, salespersons, lawyers, medical transcriptionists, telephone operators and clergy. These professional voice users use their voice in different situations and in different ways according to the need.

In Islam, there are a few groups of population who are professional voice users such as Qari, Hafiz, Muezzins, Qawwals, naa't khawans, religious preachers, etc.

Hafiz (Huffaz-plural) is an individual who memorizes all the chapters of Qur'an. This group of individuals masters the holy book in a course period for few years later on they work as teachers (Quranic verse recitation teachers) in schools of Islamic theology (madrasa) and also perform special prayers (recitation) on various occasions. It is observed that most of the Huffaz try to recite melodiously. In a survey Boominathan *et al.*, (2008) studied 400 voice professionals (100 singers, 100 teachers, 100 politicians and 100 vendors) in India for vocal abuse and vocal hygiene practices. A questionnaire regarding vocal abuse and vocal hygiene practices was administered. All subjects were indulged in throat clearing, loud speaking or singing for longer durations. The most common symptoms changed in voice quality, voice fatigue, and discomfort in throat, hoarseness, loss of voice, loss of intelligibility/clarity of speech, dry throat, shortness of breath and loss of voice control. The results revealed 86% of politicians, 74% vendors, 59% of singers and 49% of teachers reported to have voice problems. 37% of singers and 47% of teachers reported to have long lasting problems of voice (duration of more than a week). Lopez (2008) studied the epidemiology of voice disorders among teaching professionals in Spain to calculate the prevalence and incidence of voice disorders among voice disorders among teaching staff. A case-control study was performed with teachers, they were asked to fill out standard questionnaire, a complete laryngeal, ear, throat and nose evaluation and video laryngoscopy was performed. The results stated that the prevalence of voice disorders among teaching staff was 57% & the most prevalent lesions were vocal overstrain nodular lesions and hyper functional dysphonia. The incidence rate was 3.87 new cases per year per 1000 teachers. Kovacic et al (2002) in a study

investigated the difference in acoustic characteristics of voice between adolescent actors and non-actors. The recorded samples of sustained vowel phonation /a/, spontaneous speech and oral reading were collected from 10 actors, 27 non-actors (13 girls and 14 boys). Voice parameters such as F0, jitter, Shimmer, Speaking and Reading ranges are compared. Significant difference in speaking range, reading Fo maximum, and reading range were seen between actresses and non-actresses, whereas significant difference was found only in reading range between actors and non-actors. Among all voice professionals, teachers are more likely to develop voice problems and report high rates of specific voice symptoms and symptoms of physical discomfort during voicing (Smith, Gray, Dove, Kirchner & Heras, 1997). Many teachers may experience vocal fatigue soon after the beginning of their careers. Those who teach physical education, drama, and music are especially prone to the effects of vocal fatigue, but any teachers who uses his/her voice to control classroom behavior is at risk. In many cases, the condition progresses from year to year. Eventually, the severity of the symptoms reaches a point where it is difficult, painful and even impossible to continue teaching through the end of a school day, week, or year. Rantala et al (2000) in a study investigated the voice changes in teachers during work. The subjects consisted of 33 female primary and secondary school teachers who recorded their first and last sessions during one working day. The subjects were studies both as one group and two subgroups (those with many and those with few voice complaints). Estimates of fundamental frequency (Fo), Sound Pressure Level (SPL), the standard deviations of these values (Fo Standard Deviations SD; SPL SD) and Fo time (vibration time of vocal folds) were recorded. The results showed that some voice features changed during the working day. The changes were not, however monotonic. They were not the same during every period and in all variables and the changes were different in the subgroups. The most obvious and uniform changes were seen in Fo; it increased toward the end of the working day. Ahlander (2011) studied Speaker's comfort in teaching environments and voice problems in Swedish teaching staff from 23 randomized schools. Questionnaires were distributed among the subjects regarding the environment and the voice problems they are experiencing. Results showed that 13% of the subjects reported voice problems occurring sometimes, often, or always. The teachers with voice problems rated items on room acoustics and work environment more noticeable. They also reported voice symptoms, such as hoarseness, throat clearing, and voice change to significant higher degree. Absence from work because of voice problems was significantly seen in teachers with voice problems. Acoustic voice analysis is now widely available on today's multimedia computers and knowledge of the acoustics of the trained and untrained singing voice has

advanced dramatically in recent years. Choi. S. H. et al. (2012) studied the effect of segment selection on acoustic analysis. They used moving window method by isolating consecutive, overlapping segments of the raw voice signal from onset through offset on 10 normal voice signals for acoustic measures (jitter, shimmer, and signal to noise ratio). The location and value of minimum/maximum SNR was compared across individuals. The moving window method was compared with data from the whole vowel excluding onset and offset, the mid-vowel, and the visually selected steadiest portion of the voice signal. The results showed that the steadiest portion of the waveforms, as defined by minimum perturbation and maximum SNR values, was not consistent across individuals. Perturbation and nonlinear dynamic values differed significantly based on what segment of the waveform was used. Other commonly used segment selection methods resulted in significantly higher perturbation values and significantly lower SNR values than those determined by the moving window method. The selection of a sample for acoustic analysis can introduce significant inconsistencies into the analysis procedure. The moving window technique may provide more accurate and reliable acoustic measures by objectively identifying the segment of the voice sample. Due to the limitations of studies on professional voices users mainly on Quranic teachers, this study was done to know the effects of voice usage on qur'anic teachers in comparison of normal teachers. The study was conducted to find out the vocal parameters in Qur'anic verse recitation teachers (QRT-Huffaz) and the regular teachers (RT).

METHOD:

A total of 60 subjects were selected for the study. The subjects comprised of two groups: Qur'anic verse recitation teachers (30 males) and regular school teachers (30 males) in the age range of 20 -40 yrs. Based on the age the qur'anic verse recitation teachers are categorized into two groups QRT-I(20 to 30 years of age) and QRT-II(30 to 40 years of age). The subjects were asked to take a deep breath and phonate /a/, /i/, /u/ vowels for as long as possible. The phonation samples of both the groups recorded were analyzed in PRAAT (version 5.3.30) software. Acoustical parameters like Mean fundamental frequency Fo (Hz), Jitter (%), Shimmer (%), Harmonics to Noise Ratio (HNR) (dB) were measured. Statistical analysis was done by using SPSS software to measure means and SDs for both QRT and RT groups. Independent sample t-test was applied to find the difference in the acoustical parameters in 3 vowel productions between the age groups (I & II) in both the groups of QRT and RT. To analyze the difference in acoustical measures 3 vowel productions in both the groups of QRT and RT, one way ANOVA was applied.

RESULTS AND DISCUSSION

Results revealed that the mean values, SD values were calculated for QRT-I and QRT-II groups. The independent sample t-test was administered; the results and p-values are given in the following table 4.1

Table 1: Mean and standard deviation, t-value and p-value for /a/, /i/ & /u/ of QRT-I and QRT-II.

vowels	Parameters	Subjects	N	Mean	Std. Deviation	t-value	p-value
/a/	mean pitch /a/	QRT-I	15	145.68	28.97	-1.906	0.067
		QRT-II	15	164.55	25.12		
	jitter(local) /a/	QRT-I	15	0.38	0.16	2.226	0.034
		QRT-II	15	0.25	0.13		
	shimmer(local)% /a/	QRT-I	15	3.25	2.51	-1.232	0.228
		QRT-II	15	4.77	4.07		
	HNR /a/	QRT-I	15	19.58	4.88	-0.644	0.525
		QRT-II	15	20.70	4.58		
/i/	mean pitch /i/	QRT-I	15	151.78	30.31	-1.772	0.087
		QRT-II	15	170.66	28.01		
	jitter(local) /i/	QRT-I	15	0.26	0.13	0.297	0.769
		QRT-II	15	0.25	0.09		
	shimmer(local)% /i/	QRT-I	15	3.94	3.24	1.256	0.220
		QRT-II	15	4.65	3.33		
	HNR /i/	QRT-I	15	21.74	7.52	-0.503	0.619
		QRT-II	15	23.00	6.17		
/u/	mean pitch /u/	QRT-I	15	154.71	28.76	-1.925	0.064
		QRT-II	15	173.63	24.91		
	jitter(local) /u/	QRT-I	15	0.32	0.18	-0.955	0.348
		QRT-II	15	2.16	7.45		
	shimmer(local)% /u/	QRT-I	15	6.45	5.31	2.068	0.048
		QRT-II	15	3.29	2.59		
	HNR /u/	QRT-I	15	22.08	7.26	-1.441	0.161
		QRT-II	15	25.40	5.20		

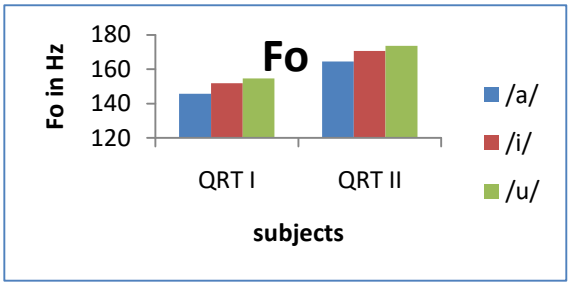

Figure 1A: Comparison of Fo between QRT-I and QRT-II for the production of /a/, /i/ and /u/.

Comparison between RT-I and QRT-I:

The mean values, SD values were calculated for RT-I and QRT-I groups. The independent sample t-test was administered; the results and p-values are given in the following table 4.2

Table 2: Mean and standard deviation, t-value and p-value for /a/, /i/ & /u/ of RT-I and QRT-I.

Vowel	Parameter	subjects	N	Mean	Std. Deviation	t-value	p-value
/a/	mean pitch /a/	RT-I	15	132.18	15.67	-1.588	0.124
		QRT-I	15	145.68	28.97		
	jitter(local) /a/	RT-I	15	0.65	0.68	1.501	0.145
		QRT-I	15	0.38	0.16		
	shimmer(local)% /a/	RT-I	15	4.37	2.79	1.157	0.257
		QRT-I	15	3.25	2.51		
	HNR /a/	RT-I	15	19.91	6.21	0.163	0.872
		QRT-I	15	19.58	4.88		
/i/	mean pitch /i/	RT-I	15	138.10	19.72	-1.465	0.154
		QRT-I	15	151.78	30.3		
	jitter(local) /i/	RT-I	15	0.62	0.59	2.264	0.032
		QRT-I	15	0.26	0.13		
	shimmer(local)% /i/	RT-I	15	7.85	5.79	0.414	0.682
		QRT-I	15	6.94	6.24		
	HNR /i/	RT-I	15	20.70	6.37	-0.407	0.687
		QRT-I	15	21.74	7.52		
/u/	mean pitch /u/	RT-I	15	135.13	14.40	-2.357	0.026
		QRT-I	15	154.7	28.76		
	jitter(local) /u/	RT-I	15	0.57	0.94	1.022	0.315
		QRT-I	15	0.32	0.18		
	shimmer(local)% /u/	RT-I	15	6.92	4.27	0.267	0.791
		QRT-I	15	6.45	5.31		
	HNR /u/	RT-I	15	20.74	5.42	-0.575	0.570
		QRT-I	15	22.08	7.26		

Figure 2A: Comparison of Fo between RT-I and QRT-I for the production of /a/, /i/ and /u/.]

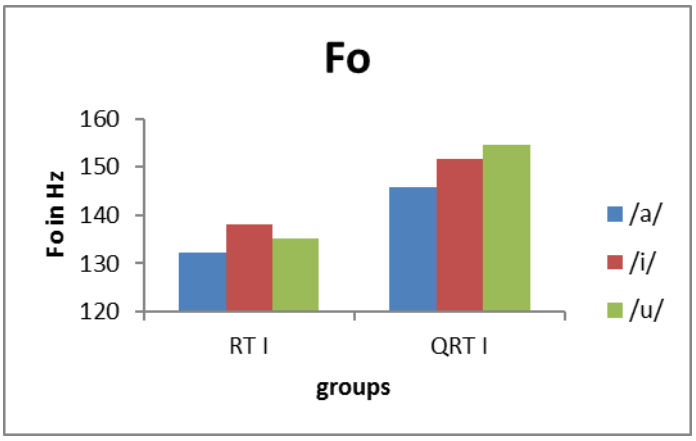

Figure 2B: Comparison of Jitter between RT-I and QRT-I for the production of /a/, /i/ and /u/.

Comparison between RT and QRT (overall results)

The mean values, Standard deviation (SD) values were calculated for RT and QRT groups. One-way ANOVA was administered; the results and p-values are given in the following table 4.4

Table 3: Means, standard deviations, f-value and p-values of /a/, /i/ & /u/ for RT and QRT.

Vowel	parameters	subjects	N	Mean	Std. Deviation	f value	p-value
/a/	mean pitch /a/	RT	30	136.11	17.77	9.700	0.003
		QRT	30	155.12	28.32		
	jitter(local) /a/	RT	30	1.26	4.15	1.566	0.216
		QRT	30	0.31	0.16		
	shimmer(local)% /a/	RT	30	4.00	2.56	0.000	0.986
		QRT	30	4.01	3.41		
	HNR /a/	RT	30	20.88	5.88	0.291	0.592
		QRT	30	20.14	4.69		
/i/	mean pitch /i/	RT	30	145.07	21.31	5.720	0.020
		QRT	30	161.22	30.24		
	jitter(local) /i/	RT	30	0.44	0.46	4.430	0.040
		QRT	30	0.26	0.11		
	shimmer(local)% /i/	RT	30	5.98	4.75	0.021	0.885
		QRT	30	5.79	5.05		
	HNR /i/	RT	30	21.96	5.99	0.062	0.804
		QRT	30	22.37	6.79		
/u/	mean pitch /u/	RT	30	147.44	24.36	6.058	0.017
		QRT	30	164.17	28.13		
	jitter(local) /u/	RT	30	0.41	0.67	0.725	0.398
		QRT	30	1.24	5.26		
	shimmer(local)% /u/	RT	30	5.26	3.71	0.139	0.711
		QRT	30	4.87	4.41		
	HNR /u/	RT	30	22.85	5.42	0.341	0.562
		QRT	30	23.74	6.43		

Figure 3A: Comparison of Fo between RT and QRT for the production of /a/, /i/ and /u/.

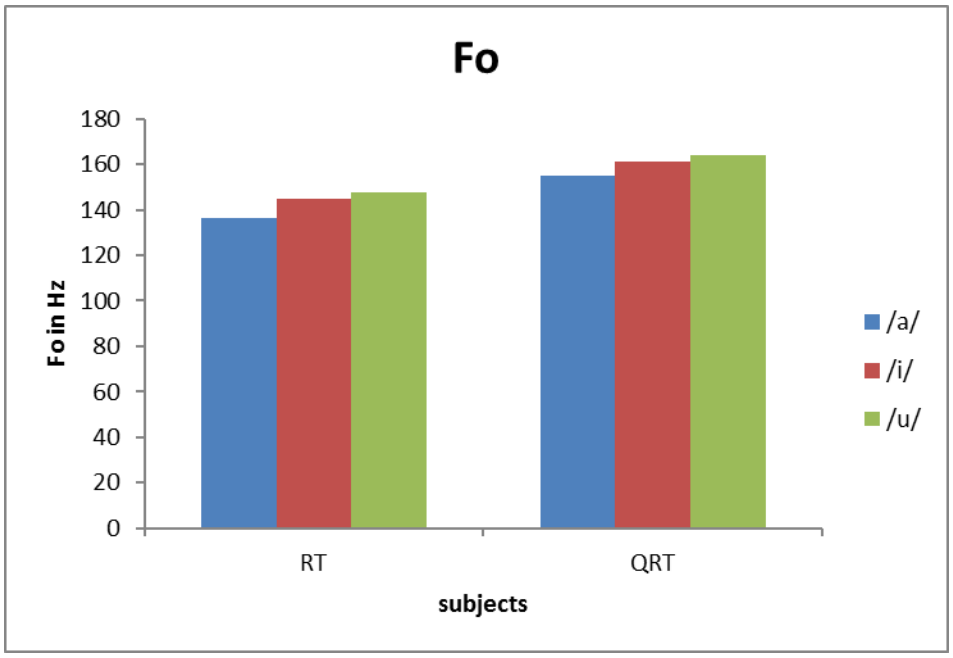

Figure 3B: Comparison of Jitter between RT and QRT for the production of /a/, /i/ and /u/.

One-way ANOVA was used to determine the significance between the two groups. The average Fo means of RT is 136.11, 145.07, 147.446 and QRT is 155.12, 161.22, 164.173 for /a/, /i/ and /u/ respectively and the p-value for /a/ is 0.003 which is <0.01, hence there is highly significant difference for /a/ and the p-values for /i/ and /u/ are 0.02 and 0.017 which are <0.05, hence there is a significant difference. For jitter the p-values are 0.216, 0.398 for /a/ & /u/ which are >0.05 hence there is no significant difference but the p-value for /i/ is 0.04 which is <0.05, hence there is significant difference for /i/. The p-values for shimmer are 0.986, 0.885, 0.711 for /a/, /i/ and /u/ respectively which are >0.05, hence there is no significant difference in RTs and QRTs for shimmer values. For HNR the p-values are 0.592, 0.804 and 0.562 for /a/, /i/ and /u/ respectively which is >0.05 and hence there is no significant difference in HNR for both the age groups.

From the above results the formulated hypothesis "There is no significant difference in the voice parameters between QRTs and RTs" is accepted for jitter, shimmer and HNR whereas it is rejected for mean Fo values. The difference in the fundamental frequency can be attributed to the fact that Qur'anic recitation teachers undergo significant vocal stress due to their job profile which includes prolonged voice usage, heavy vocal loading, vocal loading may be attributed to prolonged voice usage, work environment, where background levels of noise affect quality and also stress on voice to achieve proper musicality for recitation.

The subglottal pressure raises Fo where it stretches the vocal folds laterally and thus makes them stiffer (Titze, 1984), stiffer material in turn vibrate at a higher frequency, the variations are seen in QRT who stress their voice and hence varies the subglottal pressure. Hence, the mean Fo values are seen to be higher in QRTs. The increase in Fo values across the age can be explained with experience and more vocal load in the individuals. Gelfer et al (1991), effects of prolonged loud reading on selected measures of vocal function in trained and untrained singers, the voice of untrained singers demonstrated more significant changes, including an increase in Fo for two of three vowels.

The shimmer values are relatively higher in both the QRT and RT groups, the voice overuse leads to deterioration of voice quality due to which amplitude perturbation get affected this was attributed to demand of voice over a period of time. Higher shimmer has been found to correlate with breathiness ratings (McAllister, Sundberg&Hibi, 1996), but in contrast it has also been reported that shimmer appears to be more related to the irregular vocal fold function associated with rough phonation (Kreiman, Gerratt&Percoda, 1990; Wolfe & Martin, 1997) rather than "the unmodulated airflow accompanying phonation in the breathy voice type" (Awan & Roy, 2005). Hence, it can be noted that QRTs are prone to voice pathologies.

The results are strong in showing the increased Fo and shimmer values indicating increased vocal load in daily work of QRTs

CONCLUSION

The overall comparison of QRT with RT revealed an increase in mean Fo of QRT and differed significantly whereas the other parameters did not differ significantly. The shimmer values in both the groups were not significantly differed but the values increased in both the groups. The increase in shimmer is the imbalance in mass and tension between the vocal fold which produces irregular vocal fold function (Titze, 1994).

The results from this study indicate that QRTs as a group may have an especially high risk of incurring voice problems as a result of high vocal demands. Hence this study concludes that QRT are at risk of getting dysphonic voice and other hyperfunctional voice disorders same as those of RT. This study provides an explanation of voice changes in Qur'anic verse recitation teachers with increase in age till 40 years. It aids in the assessment and management of voice

disorders in Quranic recitation teachers. And also assists the Speech pathologists/voice pathologists in planning the Professional voice coaching program during the management.

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