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Preliminary Speech Rate Normative Data in Adult Jordanian Speakers

Mohammad A. Damhoureyeh
Department of Hearing and Speech Sciences, School of Rehabilitation Sciences, the University of Jordan, Amman, Jordan

Wesam B. Darawsheh
Department of Occupational Therapy, School of Rehabilitation Sciences, the University of Jordan, Amman, Jordan

Wa'el N. Qa'dan
Department of prosthetics and orthotics, School of Rehabilitation Sciences, the University of Jordan, Amman, Jordan

Yaser S. Natour
Department of Hearing and Speech Sciences, School of Rehabilitation Sciences, the University of Jordan, Amman, Jordan

***Abstract*—Studies conducted to establish normative data on speech rate; including speaking and articulation rate, for the Jordanian Arabic dialect are scarce. Aim: to establish preliminary normative data on speaking and articulation rate for the adult male and female Jordanian Arabic speakers. Methodology: The sample of the study comprised 51 participants (23 males and 28 females), age (18-25 yrs, mean 20.82 yrs ±1.52). Spontaneous speech and reading samples were collected from participants. Results: Means of articulation rates during the tasks of spontaneous speech and reading passage were (140.07 w/m, 161.83 w/m, respectively), while the means of speaking rates during the tasks of spontaneous speech and reading passage were (124.51w/m, 141.36w/m, respectively). The ANOVA showed no significant differences (p=0.237) attributed to the effect gender on the articulation or the speaking rates in both tasks of spontaneous speech and reading passage. Pearson-r test showed moderate-strong positive correlations between articulation and speaking rates during both the reading passage and the spontaneous speech tasks (p<0.01, r = 0.416; p <0.001, r = 0.962, respectively). Conclusion: this study can be of a clinical significance in the evaluation and treatment of fluency, articulation and motor speech disorders.**

***Index Terms*—Arabic, speech rate, Jordanian dialect, normative data, speaking rate, articulation rate**

I. Introduction

Speech rate is traditionally defined as the number of production units such as phones or phonemes, syllables, or words during a defined time period (Goldman-Eisler, 1968). It is an important measure that affects the intelligibility of verbal messages, and the perception of the speaker's personality, and mental and emotional status, in addition to speaking conditions (Apple, 1979; Robb, Maclagan and Chen, 2004). It also includes information about the number and the duration of disfluencies that a speaker produces, and the amount of time it takes a speaker to convey a particular intention (Bloodstein & Bernstein-Ratner, 2008). Additionally, speech rate may help identify a speaker when he/she utilizes some kind of voice disguise (Rodriguez, Perez & Pedroso, 2014).

The establishment of speech rate normative data has important clinical applications pertaining to the diagnosis and intervention strategies of several speech and communication disorders (Lee & Doherty, 2017). Speech rate can be clinically used in the evaluation of disturbances such as dyslexia (Smith, Roberts, Smith, Locke & Bennette, 2006), stuttering, cluttering, hearing problems, and motor speech disorders, such as dysarthria (American Speech, Language, and Hearing Association [ASHA], 2016a; ASHA, 2016b; Chon & Ambrose, 2012; Lee & Doherty, 2017; Wang, Kent, Duffy & Thomas, 2005).

Moreover, speech rate is useful in the assessment of communicatively disordered populations (Bloodstein & Bernstein-Ratner, 2008). Smith et al. (2006) for instance stated that speech rate is slower in children who have dyslexia than in normal population (Smith et al., 2006). In fact, some clinical interventions are based on the strategy of controlling speech rate, such as speaking in a slow speech rate with children or adults who suffer from stuttering (Stuart, Kalinowski, Rastatter, Saltuklaroglu, & Dayalu, 2004). Wang et al. (2005) found that adjusting speech rate is often used as a procedure for treating motor speech disorders. For example, patients with dysarthria may be guided into speaking in a slow pace and better articulation precision in order to promote better speech intelligibility (Wang et al. 2005).

Multiple methods for calculating speech rate are available; two conventional and commonly used methods are speaking rate and articulation rate (Lee & Doherty, 2017; Duwal, Karki, George and Ravi, 2016; Amir and Grinfeld,

2011). Speaking rate is calculated by dividing the number of syllables or words by the time unit including the silence intervals and disfluencies (Lee & Doherty, 2017). It provides information about how quickly the person talks, and the influence of the speaking situations and emotions (Hall, Amir, & Yairi, 1999; Miller, Grosjean, & Lomanto, 1984). Articulation rate, on the other hand, is a more recent and sensitive method in estimating the time of speech execution than speaking rate. Articulation rate is not affected by silence intervals and disfluencies, and it is considered a global estimate of verbal output (Hall et al., 1999; Miller et al., 1984). Articulation rate is calculated using the same formula of calculating speaking rate but with exclusion of silence intervals and disfluencies (Lee & Doherty, 2017). Speaking rate and articulation rate were found to be positively correlated in all dialects of English in terms of length of utterance (Robb and Gillon 2007). The units of calculation of speech rate are multiple. Some studies used (words/minute) while others used (syllable/ minute) and (phone/ second) (Amir and Grinfeld, 2011; Duwal et al., 2016).

Several factors may have an effect on speech rate such as gender, age, language and dialect. The literature shows controversial results concerning the effect of gender on speech rate. For example, Duwal et al. (2016) studied speech rate including silent pauses of about 150 msec and less in 20 adult native Nepali speakers (10 males and 10 females, age 20-30 yrs). The researchers utilized a spontaneous speech sample and reading a particular passage. The study used the parameters (word per minute (w/m), syllable per minute (s/m), and syllable per second (syll/s)) in measuring the speech rate, and found that males registered insignificantly faster speech rate in spontaneous speech and significantly faster speech rate in reading than females (Males: 159.9 w/m,337.3 s/m, and 5.80 syll/s and 141.8 w/m, 381.20 s/m, and 6.30 syll/s, respectively; Females; 148.9 w/m, 307.8 s/m, and 5.1 syll/s and 115.9 w/m, 304.2 s/m, and 4.8 syll/s, respectively). In addition, Nepali speakers had significantly higher rate in spontaneous speech (154.4 w/m, 322.55 s/m and 5.45 syll/s, respectively) than in reading (128.85 w/m, 342.70 s/m and 5.55 syll/s, respectively) (Duwal et al., 2016). Leemann, Kolly & Dellwo (2014) measured speaking rate for two groups of Swiss German dialect speakers in two regions of Switzerland (115 speakers from Bern city, and 205 speakers from Zurich city). The speakers' age range was between 4 and 75 years (60% males and 40% females) Participants were invited to read a 129 syllables fable. The study found that speakers from Zurich read the fable in 46 seconds while speakers from Bern read the text in the slower rate of 54 seconds. The Study also found that adult females demonstrated a slower speaking rate than adult males (Leemann et al., 2014). Jacewicz, Fox, O'Neill & Salmons (2009) used (Syllables per second (syll/s) in measuring the articulation rate in 94 American speakers from two regions (South-central Wisconsin and Western North Carolina). The participants were divided into two groups-40 older adults (51-65 yrs), further sub grouped into speakers from South-central Wisconsin (20) and speakers from North Carolina (20). The participants were then subdivided into 10 males and 10 females from each region. The Authors found that adult females demonstrated a significantly slower articulation rate in the task of reading than adult males (3.33 and 3.48 syll/s, respectively). They also found that the articulation rate in spontaneous speech was slower for females than males but remained insignificant (5.03 and 5.2 syll/s, respectively). Moreover, the study found that the articulation rate was faster in spontaneous speech than in reading in all investigated regions (Jacewicz et al., 2009). Lee and Doherty (2017) used the (Syllable per minute (s/m) parameter) in measuring speech rate, and noticed that the speaking and articulation rate in each speech task (spontaneous and reading) were faster in 22 Irish men (Speaking rate (266 s/m and 293 s/m), Articulation rate (353 s/m and 341 s/m, respectively) than in 22 Irish women (Speaking rate (275 s/m and 282 s/m), Articulation rate (335 s/m and 323 s/m, respectively). The study also found that speaking rate in reading (299 s/m) was faster than in the spontaneous speech task (271 s/m), but with insignificant difference in articulation rate. Furthermore, Amino and Osania (2015) used reading a passage to measure the articulation rate in four languages (Japanese, Korean, Chinese and Thai) for 74 participants (32 Japanese, 20 Korean, 14 Chinese and 8 Thai) aged between 18-48 years, and found that the articulation rate for males in all investigated languages was faster than that of females. They also found that the female articulation rate was faster than males in Thai language. The articulation rate for Japanese male speakers was 7.81 syll/s, and for females 6.95 syll/s, whereas other nationalities articulation rate was as follows: Korean (males 6.43 syll/s, females 6.27 syll/s), Chinese (males 5.45 syll/s, and females 5.14 syll/s., Thai (males 4.36 syll/s, and females 4.53 syll/s) (Amino and Osania, 2015). Robb et al. (2004) also found that there was no significant difference for speaking and articulation rate during reading between males and females in 40 New Zealand English speakers (20 males and 20 females with a mean age of 19 years for females and 20 years for males), and 40 American English speakers (20 males and 20 females with a mean age of 27 years for females and 33 years for males). The Researchers reported that the mean values of the speaking rate for New Zealand males was 277 s/m and 284 s/m for females. On the other hand, the mean values of speaking rate for American males was 245 s/m and 254 s/m for females. The mean values of articulation rate for New Zealand males were 346 s/m and 341 s/m for females. The articulation rate for American males was 315 s/m and 318 s/m for females (Robb et al., 2004).

The literature reviewed shows that Languages and dialects did influence speech rate. For example, Irish English speakers showed faster speaking and articulation rate than other English dialect speakers from New Zealand and America (Robb et al., 2004, Lee & Doherty, 2017). In addition, Amino and Osania (2015) showed that the Japanese speakers had the fastest articulation rate as compared to the Korean, Chinese, and Thai speakers (Amino and Osania, 2015)

Robb et al. (2004) also found that New Zealand English speakers demonstrated faster speaking and articulation rate (280 s/m, 342 s/m, respectively) than American English speakers. Furthermore, Robb et al. (2004) stated that there was

a difference of (30 s/m) in the speaking and articulation rate between the two English dialects. That is, the speaking rate for American English was (250 s/m) and the articulation rate was approximately (300 s/m) (Robb et al. 2004).

Jacewicz et al. (2009) found that the articulation rate for overall American speakers in two regions during a spontaneous task (5.12 syll/s) was faster than reading (3.40 syll/s). They also reported that the speakers in Northern America (from Wisconsin) had faster articulation rate during spontaneous and reading task (5.41 and 3.54 syll/s, respectively) than speakers in southern America (from North Carolina) (4.81 and 3.27 syll/s, in that order) (Jacewicz et al., 2009).

The effect of age on speech rate was also investigated. Amino and Osania (2015) reported that older people tend to speak slower than young people (Amino and Osania, 2015). Jacewicz et al. (2009) found that young adults speak faster than older adults (Jacewicz et al., 2009). On the contrary, Amir and Grinfeld (2011) also reported that the articulation rate among children and adolescent increased with age (Amir and Grinfeld, 2011).

Studies targeting speech rate of Arabic speakers or of any of the Arabic dialects are scarce. Therefore, the current study aims to establish preliminary speech rate normative data for Jordanian Arabic speakers. The study will constitute a benchmark for measuring normative data of speech rate in other dialects of Arabic. Another aim of this study is to compare the resulting preliminary data with the results of other available languages and dialects. The influence of gender on Jordanian Arabic speech rate is identified and compared with other languages.

Correlation between speaking and articulation rate during speech tasks was conducted to highlight the importance of their combined use in the calculation of speech rate.

II. Material and Methods

Ethical approval to conduct the study was granted by the deanship of scientific research at the University of Jordan and by the institutional review board at the University of Jordan hospital.

A. Participants

Participants were recruited after obtaining their informed consent. Convenience and snow-ball sampling methods were employed. Potential participants were students who were approached at the school of rehabilitation sciences, the University of Jordan.

Participants were adults (≥18 yrs of age) and speakers of Jordanian Arabic. A self- administered questionnaire was used as a method for excluding participants who have health conditions that could affect speech rate calculation. Participants were asked to state their gender, age, and whether they had any respiratory, language, or speech problems. Those with respiratory problems, such as Chronic Obstructive Pulmonary Diseases (COPD), or any form of speech or language problems at the time of data collection (respiratory infections, chromic or acute voice disorders, hypernasality, stuttering etc.) were excluded from the study. The study also incorporated communication disorders screenings in addition to the self-report. The screening was conducted by two speech language pathologists who had an expertise of 25 years in speech and language pathology practice.

B. Procedures

Two speech samples were collected from each participant; spontaneous speech and reading. As for the spontaneous speech samples, participants were encouraged to speak for 3-5 minutes as recommended by Lee & Doherty (2017) to elicit the production of at least 200 different utterances (Guitar (2006) and Shipley and MacAfee (2009)). Open-ended questions concerning topics such as friend activities, study topics, and interests were used to elicit responses (Lee & Doherty, 2017). As for the reading samples, participants were asked to read a selected paragraph from a refereed journal. The paragraph included all Arabic sounds following the recommendations of Shipley and MacAfee (2009) and included more than 308 words as suggested by Guitar (2006). All samples were collected using a digital voice recorder (Olympus, WS-600S, China).

Both the articulation and the speaking rate were used to establish preliminary results of Jordanian Arabic. For the purpose of the current study, the authors utilized words as the unit of count (Guitar, 2006). Articulation and speaking rate were calculated by dividing the total number of words produced in all spontaneous and reading utterances after excluding interjections and disfluencies.

Speaking rate was calculated by dividing the total number of words by the total utterance duration including the period of silent intervals that were estimated to be less than 2 sec and including dysfluencies time (Guitar, 2006). Articulation rate was calculated following the same procedure but with the exclusion of the time of silent intervals and dysfluencies (Lee & Doherty, 2017).

C. Data Analysis

Statistical analysis was performed using IBM SPSS Statistics 22, (IBM Corporation, USA). Participants were classified into subgroups according to gender. Descriptive statistical analysis of categorical variables of gender was conducted, and then a One-way ANOVA was used to compare the means of speaking and articulation rate (i.e. in the two tasks of reading versus spontaneous speech) between gender subgroups. P value was set to be below 0.05 ($P < 0.05$) to test any significant effect of gender on speaking and articulation rate.

The correlation between speaking and articulation rate in the two speech tasks (spontaneous speech and reading) was also investigated by conducting a Pearson-r test. P value was set at .01. Values of correlation coefficient-r below 0.39 were considered weak, values between 0.4–0.59 were considered moderate, whereas values more than 0.60 were considered as strong correlations (Mukaka, 2012).

III. Results

The study sample consisted of 51 participants (age range 18- 25 yrs; mean age 20.82 ±1.52). There were 23 (45.1%) males (mean age 20.54 yrs ± 1.59); and 28 (54.9%) females (mean age 21.07 yrs ± 1.43).

Articulation rate mean during reading for the whole sample was 161.83 ± 36.80 w/m; while articulation rate mean during spontaneous speech was 140.07 ± 28.59 w/m (Table 1). Speaking rate mean during reading and spontaneous speech was 141.36 ± 16.76 w/m and 124.51 ± 25.34 w/m, respectively (Table 1). Articulation and speaking rate during reading were faster than spontaneous speech. In addition, the articulation rate was faster than speaking rate for all participants.

Table 1.
Means & Standard Divisions Of Articulation And Speaking Rates As Arranged By Gender

Gender	Articulation rate		Speaking rate	
	Spont.	Reading	Spont.	Reading
Females	137.81 ± 30.29	160.64 ±42.04	125.28 ±25.07	140.12 ±12.78
Males	142.83 ± 26.78	163.28 ±30.07	123.58 ±26.21	142.87 ±20.84
Total	140.07 ±28.59	161.83 ±36.80	124.51 ±25.34	141.36 ±16.76

Note. Spont. = Spontaneous speech, unit = words/minute.

As for gender, articulation and speaking rate during reading were faster in males than in females (163.28 ±30.07, 160.64 ±42.04 and 142.87 ±20.84, 140.12 ±12.78, respectively). This was also true when comparing articulation rate in spontaneous speech sample, as males showed faster articulation rate than females (142.83 ± 26.78, 137.81 ± 30.29, respectively). On the other hand, speaking rate in the spontaneous speech sample showed faster rates for female participants than males (125.28 ±25.07, 123.58 ±26.21, respectively) (Table 1).

One-way ANOVA analysis showed that gender has no significant effect on speaking and articulation rate during all speech tasks (Spontaneous and Reading) (p= 0.237). Gender has no effect on articulation rate during spontaneous speaking and reading (p=0.538, 0.802, respectively), and on speaking rate during spontaneous and reading (p= 0.814, 0.566, respectively).

Correlation between articulation and speaking rate during reading was found to be moderately positive and significant ($p<0.01$, $r = 0.416$). Correlation between articulation and speaking rate during spontaneous task was found to be strongly positive and significant ($p <0.001$, $r = 0.962$).

The correlation between speech tasks per rate type was found weak and insignificant ($p>0.01$, $r < 0.39$). The correlation between reading and spontaneous articulation rate was found to be negative and insignificant (p= 0.559, r=-0.084). On the other hand, the correlation between reading and spontaneous speaking rate was found to be weakly positive and insignificant (p= 0.261, r= 0.160) (Table 2).

Table 2.
Correlations Between Articulation And Speaking Rates Across Tasks

Correlations	Articulation rate		Speaking rate	
	Spontaneous	Reading	Spontaneous	Reading
Articulation rate				
Spontaneous	1	-0.084	0.962***	0.155
Reading	-0.084	1	-0.034	0.416**
Speaking rate				
Spontaneous	0.962***	-0.034	1	0.160
Reading	0.155	0.416**	0.160	1

Note. *Significant on $p < 0.05$ level, ** Significant on $p < 0.01$ level, *** Significant on $p < 0.001$ level.

IV. Discussion

Investigations targeting normal speech rate (speaking and articulation rate) during conversation and reading in Jordan are scarce. The current study is a preliminary effort to establish speaking and articulation rate normative data among adult male and female Jordanian speakers. The samples utilized were conversation and reading a passage.

Studies reviewed by the current investigation (Table 3), used different methodologies for calculating speaking and articulation rate. Some studies used syllable per second (syll/s) like Duwal et al. (2016), Jacewicz et al. (2009), and Amino and Osania (2015). Other studies used syllable per minute (s/m) like Duwal et al. (2016), Lee and Doherty (2017) and Robb et al. (2004). Duwal et al. (2016) used word per minute (w/m) where they calculated speech rate including mean silent pauses. The current study used the same methodology to investigate the effect of gender on articulation and speaking rate during spontaneous speech and reading.

TABLE 3.
RESULTS OF PREVIOUS STUDIES ON THE EFFECT OF GENDER ON SPEECH RATES ACROSS DIFFERENT LANGUAGES

Gender	Articulation rate		Speaking rate		Speech rate		Reference	Dialect/ Language
	Spont.	Reading	Spont.	Reading	Spont.	Reading		
Females	137.81 w/m	160.64 w/m	125.28 w/m	140.12 w/m	-	-	Current Study	Jordanian Arabic
	-	-	-	-	-148.9 w/m	115.9 w/m	Duwal et al. (2016)	Nepali
	-	-	-	-	307.8 s/m	304.2 s/m		
	-	-	-	-	5.1 syll/s	4.8 syll/s		
	5.03syll/s	3.33syll/s	-	-	-	-	Jacewicz et al., 2009	Northern and Southern American English
	335 s/m	323 s/m	275 s/m	282 s/m	-	-	Lee & Doherty, 2017	Irish- English speakers
	-	6.95syll/s	-	-	-	-	Amino and Osania, 2015	Japanese
	-	6.27syll/s	-	-	-	-		Korean
	-	5.14syll/s	-	-	-	-		Chinese
	-	4.53syll/s	-	-	-	-		Thai
	-	341 s/m	-	284 s/m	-	-	Robb et al., 2004	New Zealand English
	-	318 s/m	-	254 s/m	-	-		American English
Males	142.83 w/m	163.28 w/m	123.58 w/m	142.87 w/m	-	-	Current Study	Jordanian Arabic
	-	-	-	-	159.9 w/m	141.80w/m	Duwal et al. (2016)	Nepali speakers
	-	-	-	-	337.3 s/m	381.20 s/m		
	-	-	-	-	5.80 syll/s	6.30 syll/s		
	5.2 syll/s	3.48syll/s	-	-	-	-	Jacewicz et al., 2009	Northern and Southern American English
	353 s/m	341 s/m	266 s/m	293 s/m	-	-	Lee & Doherty, 2017	Irish- English speakers
	-	7.81syll/s	-	-	-	-	Amino and Osania, 2015	Japanese
	-	6.43syll/s	-	-	-	-		Korean
	-	5.45syll/s	-	-	-	-		Chinese
	-	4.36syll/s	-	-	-	-		Thai
	-	346 s/m	-	277 s/m	-	-	Robb et al., 2004	New Zealand English
	-	315 s/m	-	245 s/m	-	-		American English

Note. Spont. = Spontaneous speech, s/m= syllables/minute, w/m= words/minute, syll/s = Syllables/ second.

The current study results showed that the males registered faster, but insignificant, articulation and speaking rate during reading than females. The same result was found in articulation rate during spontaneous speech. Those results resonate the speaking rate reported by Duwal et al. (2016) and the articulation rate reported by Jacewicz et al. (2009). The results also resonate the articulation rate for New Zealanders reported by Robb et al. (2004) who used a reading passage as their study sample. Speaking rate in Duwal et al. (2016) and Leemann et al. (2014), and the articulation rate in Jacewicz et al. (2009) and in Amino and Osania (2015) had significantly faster rates in males than females. Significantly faster speech rate were also reported by Lee and Doherty (2017).

In contrast, the current study showed that females demonstrated faster, but insignificant, rate than males particularly in speaking rate during spontaneous speech. This result is similar to the results reported by Robb et al. (2004) study of speaking rate for New Zealander and of speaking and articulation rate for American speakers.

As for the comparison of speaking and articulation rate across speech tasks, the current study found that speaking and articulation rate were significantly faster during reading than spontaneous speech. This result is similar to the results of speaking rate in Lee and Dehorty (2017), with insignificant differences in articulation rate. On the other hand, speaking rate in Duwal et al. (2016) and articulation rate in Jacewicz et al. (2009) were faster during spontaneous speech than reading.

An overview of previous studies that targeted speaking rate and the measurement unit (syllable per minute (s/m) in different languages and dialects is interesting. For example, Nepali speakers had faster speaking rate than Irish- English during each speech task, but had faster speaking rate than New Zealanders, and American –English speakers. As for articulation rate during reading, Irish speakers were faster than New Zealanders, and American speakers. Speaking rate reported by the current investigation can be compared with Nepali speakers in Duwal et al. (2016) as both studies used word per minute as a measurement unit. The comparison showed that adult Jordanian speakers had faster speaking rate during reading than adult Nepali speakers. Additionally, adult Jordanian speakers had slower speaking rate during spontaneous speech than adult Nepali speakers (Table 4).

TABLE 4.
RESULTS OF PREVIOUS STUDIES ON SPEECH RATES ACROSS DIFFERENT DIALECTS AND LANGUAGES

Languages and Dialects	Articulation rate		Speaking rate		Speech rate		Reference
	Spont.	Reading	Spont.	Reading	Spont.	Reading	
Japanese	-	See table 3	-	-	-	-	Amino and Osania, 2015
Korean	-		-	-	-	-	
Chinese	-		-	-	-	-	
Thai	-		-	-	-	-	
Indo-Aryan							
Nepali	-	-	-	-	154.4w/m	128.85w/m	Duwal et al. (2016)
	-	-	-	-	322.55s/m	342.70 s/m	
	-	-	-	-	5.45 syll/s	5.55 syll/s	
English							
New Zealand	-	3342 s/m	-	280 s/m	-	-	Robb et al. (2004)
USA	-	3300 s/m	-	250 s/m	-	-	
USA	5.12syll/s	3.40syll/s	-	-	-	-	Jacewicz et al. (2009)
Northern USA	5.41syll/s	3.54syll/s	-	-	-	-	
Southern USA	4.81syll/s	3.27syll/s	-	-	-	-	
Irish	344 s/m	3352 s/m	271 s/m	299 s/m	-	-	Lee & Doherty, 2017
Arabic							
Jordanian	140.07 w/m	161.83 w/m	124.51w/m	141.36w/m	-	-	Current study

Note. Spont. =Spontaneous speech, s/m =syllables/minute, w/m =words/minute and syll/s = Syllables/ second.

The current study also found that there was significant positive correlation between speaking and articulation rate during both reading and spontaneous speech. This result is similar to Robb and Gillon (2007) in all dialects of English. In contrast, there was negative articulation rate correlation between the two speech tasks. As for the two speech tasks in speaking rate there was weak positive correlation. These results may facilitate Jordanian speech pathologists' ability to predict one measure of speech rate if the other is known. That is, if a speech pathologist calculates speaking rate, articulation rate could be at least predicted given that both rates utilize the same speech task (reading or spontaneous speech).

Exploring speech rate normative data for both measures (speaking and articulation rates) is important for designing evaluation and treatment plans for many communicative, speech, and neurological disorders (Lee & Doherty, 2017; Smith et al., 2006; American Speech, Language, and Hearing Association [ASHA] 2016a; [ASHA] 2016b; Chon & Ambrose, 2012; Bloodstein &Bernstein-Ratner, 2008; Stuart et al., 2004 and Wang et al. 2005). Additionally, gender effect on the values of speech rate across speech tasks in some languages, is worth of attention when designing evaluation and treatment plans for the Jordanian population. As such, the current study sheds some light on the methodology used in calculating and interpreting speech rate measures.

V. FUTURE RESEARCH

The current study is a preliminary normative study of speaking and articulation rate across two speech tasks (reading and spontaneous speech) for Jordanian speakers. Future studies will target different age groups across a larger sample

using variable measurement units. In addition, future studies will include samples of speaking and articulation rate from different groups of patients (fluency, articulation and motor speech disorders etc.).

VI. Conclusion

The current study concluded that there were no significant differences between male and female Jordanian speakers in articulation and speaking rate during spontaneous speech and reading. However, this study reported that males had faster, though not significant, articulation rate and speaking rate than females, with the exception of the speaking rate during spontaneous speech, where females had faster rates than males.

Furthermore, the current study noted that the articulation rate was faster than speaking rate in reading than in spontaneous speech. In addition, adult Jordanian speakers had faster articulation and speaking rate during reading than those reported by other languages. Nepali speakers, however, registered the fastest speaking rate during spontaneous speech among other languages.

The current study also found that there was significant positive correlation between speaking and articulation rate, which means that one of them, may be helpful in predicting the other in clinical settings.

Finally, the current study can be used as a preliminary effort to establish normative data for evaluating and treating patients with fluency, articulation disorders and/or motor speech disorders.

Declaration of interest

The authors report no conflict of interest.

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Mohammad A. Damhoureyeh is an instructor in the department of Hearing and Speech Sciences & Disorders, School of Rehabilitation Sciences, the University of Jordan. He obtained his Master degree in Speech and Language Pathology from the University of Jourdan in 2003, and he obtained his Bachelor degree in Arabic language and literature from the Hashemite University in 2000.

He has over 15 years of experience as a clinical supervisor and a speech and language pathologist for both children and adults in a number of settings, which include public and private schools, rehabilitation centers, and university clinics.

Mr. Damhoureyeh's experience includes working with individuals with Developmental Delays, Apraxia, Fluency Disorders, Learning Disabilities, Intellectual Disabilities, Down Syndrome, Cerebral Palsy, Hearing Impairments, Expressive/Receptive Language Impairments, Articulation/Phonology Disorders, Voice disorders. He is licensed as a Speech Pathologist by Ministry of Health, Amman, Jordan.

Wesam B. Darawsheh is an associate professor at the University of Jordan, and 2018-2019 Fulbright Postdoc Research grantee to Jacksonville University, USA.

Dr. Darawsheh is a qualified occupational therapist with experience of working in the UK and Jordan. She has a particular interest in contemporary issues such as technology, refugeeism, and cultures and their effect on education, and development. She has also an interest in Community Based Rehabilitation (CBR), occupational health in dysphagia conditions and occupational voice disorders.

Wa'el Qa'dan is a full time lecturer at the department of prosthetics and orthotics, the University of Jordan. He earned his MSc degree from the University of Salford, Manchester, UK. 2010

Yaser S. Natour is a professor of Speech-Language Pathology at the Department of Hearing and Speech Sciences & Disorders, School of Rehabilitation Sciences, University of Jordan. He worked for the Department of Special Education, the University of United Arab Emirates, 2011-2015.

Prof. Natour obtained his PhD from the University of Florida, USA in 2001, sponsored by The Fulbright Foundation and University of Jordan. He has published in the areas of voice disorders, acoustic analysis, laryngectomy rehabilitation, clinical surveys, resonance disorders and respiratory capabilities. Many of his papers appeared in international journals such as The Journal of Voice, Logopedics Phoniatrics Vocology, Rev.ista Ingeneria, BABEL, Florida Journal of Communication Disorders, in addition to other regional distinguished journals. He also has contributions in translation of specialized books from English into Arabic and book authoring.

Prof. Natour is a certified speech-language pathologist (Certificate of Clinical Competence-CCC) from the American Speech Language Hearing Association an (ASHA), certified supervisor in speech, language pathology from Abu Dhabi Health Authority (HAAD), and certified senior speech language pathologist from the Jordanian Ministry of Health). He functioned as a clinical supervisor for the Center for Phonetics Research/Speech and Hearing Clinic from 2001-20011. He also worked as a speech language pathologist voice pathologist at the University of Jordan Hospital/ Speech Clinic from 2005-20011, and he was the coordinator of the Assessment and Remedial Unit (ARU) at the United Arab Emirates University. His consultancy services included dysphagia and voice care in numerous clinical establishments (Amana Healthcare Medical and Rehabilitation Hospital, the Arab Canadian Center, Amman Center for Speech, Language and Swallowing, and other establishments). At all clinical positions, he conducted clinical evaluation and treatment for inpatients and outpatients with voice, dysphagia, neuromotor disorders, in-circuit speaking valves for ventilated patients, patients with hypernasality, etc.