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Speech Rate in Adult Syrian Arabic Speakers: Preliminary Data

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***Abstract*—Research studying the speech rate in the Arabic population is scarce. This study aimed to establish a preliminary normative speech rate of Syrian Arabic speakers and identify speech rate differences between females and males within the Syrian population. Sixty-five Syrian Arabic-speaking adults (33 females and 32 males) were recruited from Syrian universities. Data collection was performed in the speech clinics within the universities. Approximately 10-minute conversational speech and reading samples were taken from each participant. Speaking rate during conversational speech and reading tasks and articulation rate were measured in terms of words per minute (WPM) and syllables per minute (SPM). Additionally, the duration of silent intervals and pauses was measured. The normative speech rate results for Syrian Arabic speakers for speaking and reading indicate that female speakers exhibited significantly higher rates in reading tasks but reveal no significant difference between females and males in conversational speech tasks. On the contrary, silent intervals and pauses were significantly higher in males than females in reading tasks but not in spontaneous tasks. Speech rate therefore varies depending on the task and gender in the normal population. As speech rates may be vastly different between languages and even dialects of a specific language, further studies may be needed to identify the normal speech rate in other Arabic dialects.**

***Index Terms*—Arabic language, normative data, speech rate**

I. Introduction

The rate of speech is defined as the speed at which an individual produces articulatory movements to generate speech, measured in units such as phones (or phonemes), syllables, or words made by the speaker over some time (Goldman-Eisler, 1956; Pellowski, 2010; Robb et al., 2003).

Speech rate data is highly valuable in identifying and treating speech-timing disorders as the speech rate highly affects language comprehension (Blanchet & Snyder, 2010; Robb et al., 2004). Many disorders cause disturbances in speaking rate, such as stuttering, cluttering, motor speech disorders, and hearing impairment (Kent, 2000). Pellowski (2010) argued for speech-language pathologists to measure speech rate during assessment and evaluation, as speech rate plays a major role in the onset, development, and maintenance of stuttering. Controlling speech rate is considered a treatment strategy for stuttering (Max & Caruso, 1997). In addition, a common therapy technique is to decrease the speech rate in patients with hypokinetic dysarthria, where a rapid speaking rate is prominent and the speaker loses control of the articulatory movements (Robb et al., 2003). Blanchet and Snyder (2010) described speech rate control techniques in dysarthria treatment, reporting that a slower rate helps increase the speaker's articulatory precision and provides time for the listener to process the received message. Furthermore, speech rate and its effect on intelligibility were discussed in other populations, such as early implanted cochlear implant users (Freeman & Pisoni, 2017).

The most general units of measuring speech rate are words per minute (WPM), syllables per minute (SPM), and syllables per second (SPS) (Robb et al., 2004). Measuring speaking rate with WPM is less precise than using SPM or SPS, as words have variable numbers of syllables. There are a variety of different factors to consider when evaluating speech rate, such as the speaker's education, age, language, culture, and the listener (Sullivan, 2016). For example, although Australian and American English speakers produce 100 WPM, Americans speak 10 SPM more than Australians (Andrews & Ingham, 1971).

Cross-language differences relate to languages' phonological features, such as the complexity of the syllable structure, in that languages with a simpler syllable structure are spoken at a faster rate (Amino & Osani, 2015; Trouvain & Möbius, 2014). However, Cangi et al. (2020) found that cross-language differences are linked to differences in rhythm, such that syllable-timing languages such as Turkish and Spanish are faster than stress-timing languages such as English and French. Culture may also play a role in determining speech rate. Lee and Boster (1992) found that faster speech rates are perceived to promote credibility amongst American and North Korean speakers. No study has yet examined cultural influence on speech rates among Arabic speakers.

Two of the most used methods to measure speech rate are the speaking rate (SR) and articulation rate (AR) methods. Speaking rate measurements include silent intervals, pauses, and disfluencies, whereas these are omitted in articulation rate measurements to examine the articulation behavior only. However, the cutoff threshold between an articulation and a non-articulation pause has not been agreed upon. Robb et al. (2004) reviewed the literature regarding this threshold and stated that although 150–250 ms is a broadly acceptable threshold, the 50-ms threshold may also represent the articulation event. Some researchers set the threshold at 50 ms (Rob et al., 2004; Plug et al., 2022) while others choose the 150-ms threshold (e.g., Mahr et al., 2021; Redford, 2014). Measuring speech rate using speaking rate includes the effect of the speaker's emotions and the situation the individual is in, while the articulation rate measures the time of speech execution (Hall et al., 1999; Lee & Doherty, 2017; Miller et al., 1984). In the present study, the authors measured speaking rate and articulation rate in terms of SPM and WPM.

As mentioned, the speech rate measured by SPM varies depending on several factors, including spoken language (Iwasaki et al., 2002), culture, and inter-individual and intra-individual differences (Ward & Nakagawa, 2002). Intra-individual differences occur when a person varies his/her speech rate depending on conversation partner, acoustic situation, content, health, or mood (Duran et al., 2023; Freud et al., 2018).

Age is an essential factor in speech rate. Although speech rate varies depending on sampling method (Pindzola, 1989), speech rate tends to get faster as children grow as a part of the speech development process (Mahr et al., 2021; Pindzola, 1989). As for adults, however, studies have consistently found faster rates of speech among younger adults, regardless of sampling method, in conversation (Horton et al., 2010; Verhoeven et al., 2004), reading (Jacewicz & Wei, 2010), and reading and conversation (Amino & Osanai, 2015). Slower rates in older adults can be attributed to different reasons. Amino and Osanai (2015) connected speech rate to social differences. Jacewicz and Wei (2010) connected reading rate to varying reading abilities between younger and older adults, while Verhoeven et al. (2004) and Horton et al. (2010) linked speech rate to the neurological effects of aging and processing abilities that become slower in older adults.

Gender is another essential factor in speech rate. Research has shown contradictory results in the relationship between gender and speech rate. A faster speech rate in males in comparison to females was evident in some studies (Jacewicz & Wei, 2010; Lee & Doherty, 2017; Stepanova, 2011; Verhoeven et al., 2004). However, other studies found no relationship between gender and speech rate (Block & Killen, 1996; Cangi et al., 2020; Damhoureyeh et al., 2020; Kowal et al., 1975; Robb et al., 2004; Walker, 1988). Kim (2018) found that males have a higher articulation rate than females in young people between the ages of 10 and 19. However, speech rate was less influenced by gender among older individuals**.** Van Borsel and De Maesschalck (2008) investigated the difference in speech rate between transgender women and cisgender women and found no differences. Another aspect investigated in terms of gender's effect on speech rate is the influence of the interviewer's gender; this study found that male and female participants spoke at a slower rate when interviewed by a female compared to a faster rate when interviewed by a male (Kendall, 2009).

Speech rate and pauses have an inverse relationship (Kendall, 2013). Research has shown consistent differences between males and females in silent intervals and pauses. Lee and Doherty (2017) found that male speakers had a relatively longer total pause time than female speakers when reading and talking. The same results were found in children by Kowal and O'Connell (1980), as boys tend to take longer and more pauses than girls in out-loud reading and narrative production.

The speaking task is another important variable in evaluating speech rate. Quene (2005) argued that utterance length plays a major role in influencing speaking rate more than other factors such as age, gender, and regional dialect. Darling-White and Banks (2021) found a positive relationship between sentence length and speech rate in typically developing children from 10 to 14 years old. Jacewicz and Wei (2010) found that speech rate was higher in conversation tasks in comparison to reading tasks for American English speakers, results which were also found in Australian English speakers (Block & Killen, 1996). Other studies found the opposite result: participants had a higher speech rate in reading than in conversation in general, as in Irish English (Lee & Doherty, 2017) and in Jordanian Arabic (Damhoureyeh et al., 2020).

Within the same language, speakers from different regions may have different speech rates (Coats, 2019). The effect of the speaker's regional variant on articulation rate is not exclusively caused by extra-linguistic factors, such as the speaker's age and gender, but also by linguistic factors, such as speaking style and length of the utterance (Schwab & Avanzi, 2015).

Verhoeven et al. (2004) studied the Dutch-speaking language area in the Netherlands and the northern part of Belgium and found no effect of region on speech rate within four regions in Belgium but found that speakers in one region in the Netherlands speak faster compared to the rest of the country's regions. Dialectal differences were found to have a significant effect on speech rate in two states in the United States, North and South Carolina (Jacewicz & Wei, 2010). Clopper and Smiljanic (2015) also found that regional varieties of American English might affect speech rate.

Establishing speech rate normative data is important in clinical applications. However, such studies in Arabic are scarce. Damhoureyeh et al. (2020) reported a normative speech rate in the Arabic language.

Although the speakers exhibit different styles and patterns of speech, Jordanian Arabic and Syrian Arabic are still considered branches of the same language. This study aimed to establish normative data on speech rate in adults speaking Syrian Arabic, building on the work of Damhoureyeh et al. (2020). The current study addresses the following questions: a) What is the average speech rate among speakers of Syrian Arabic? b) Does speech rate differ in males and females?

II. Methodology

Ethical approval was granted by the Institutional Review Board (IRB) of Al-Ahliyya Amman University Faculty of Allied Medical Sciences (IRB # 2/13/2022-2023).

A. Participants

A total of 65 university students participated in this study: 33 females (mean age 25.4, standard deviation = 2.3) and 32 males (mean age = 25.5, standard deviation = 2.6). All participants were monolingual Syrian Arabic speakers. Participants were interviewed and assessed by a certified speech-language pathologist to rule out any communication disorders.

B. Speech Data Collection

All the speech data collections were conducted in one setting and were audio recorded. The interview process consisted of four stages. First, participants were made aware that the interview was being recorded; ethical approval was gathered from participants. Second, participants were asked to read a text of 358 words and 992 syllables in an approximate time of three minutes. The text contains all Arabic consonants with a level of reading that is convenient for college students. Third, participants were asked about their demographic information. Fourth, participants were engaged in a spontaneous conversation (topics are listed in Appendix).

C. Speech Sample

Approximately 10 minutes of conversational and reading speech samples were recorded from each participant. First, they were instructed to read an article taken from the Arabic edition of the *National Geographic* journal at their habitual level of loudness, pitch, and rate. The article contains four paragraphs with approximately 990 syllables and 358 words, including all Arabic sounds.

The participants then engaged in a 3–5 minute conversation with the researcher, as recommended by Lee and Doherty (2017). The topics were presented in the form of open-ended questions to prevent any predetermined responses that the speaker may create (Polgar & Thomas, 2011). Participants were free to talk in any manner or content they preferred.

All speech samples were recorded in a quiet room using an audio recorder application and a Samsung voice recorder version (21.3.50.34) (Samsung Voice Recorder - Apps on Google Play, n.d.). A 30-cm distance between the mouth and the recorder was maintained consistently. The recorded speech samples were then transferred to a secure computer for storage and acoustic analysis.

The reading samples of the article and the conversation samples for each speaker were analyzed using Praat (Boersma, 2007). Figure 1 provides an example of using Praat to define the words, syllables, and silent intervals in the reading task.

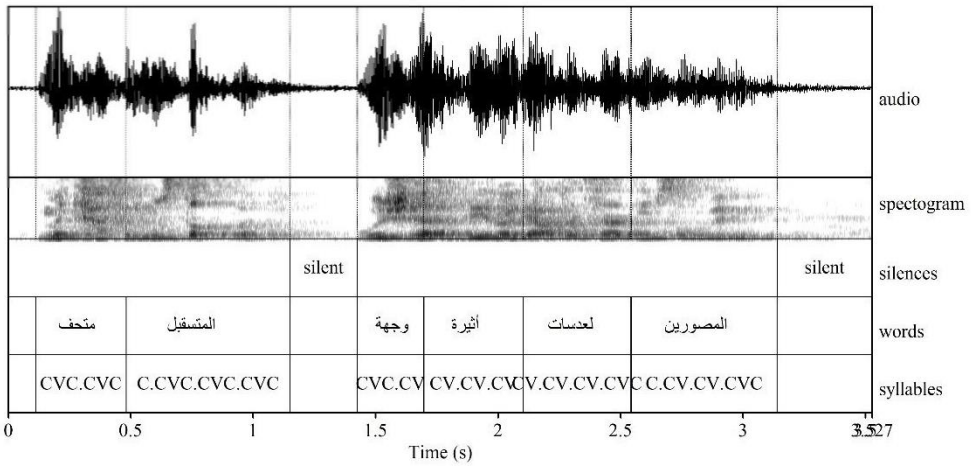

Figure 1. Reading Sample With Silent Intervals

D. Measurement of Speech Rates

(a). Speech Rate in Conversational Tasks

The conversation samples were analyzed following the methodologies of Lee and Doherty (2017) and Damhoureyeh

et al. (2020). The entire conversations were recorded in full by the third author. Three minutes were chosen for analysis, as in Schwab and Avanzi (2015). Each utterance was transcribed orthographically, and the number of syllables and words was counted. The speaking rates in SPM and WPM were determined by dividing the total number of syllables and words, respectively, by the time taken to complete speaking.

(b). Articulation Rate in Conversational Tasks

Articulation rates in SPM and WPM were calculated by dividing the total number of syllables/words by the time taken to produce them after the removal of silent intervals. The authors chose 150 ms as a threshold for the silent intervals using Praat software.

(c). Speech Rate in Reading Tasks

The start of the first syllable and the end of the last syllable in each of the paragraphs were identified and annotated based on the waveform display and wideband spectrogram. The syllable onset and offset were defined by the acoustic energy features. The time interval between the onset and offset was the total paragraph duration, measured for each speaker. Each utterance was transcribed orthographically, and the number of syllables and words was counted. To calculate the speaking rate in SPM and WPM, the total syllables and words collected from the reading samples, respectively, were divided by the duration of reading in minutes. Articulation rate in reading was measured in the same manner as conversational speech.

E. Statistical Analysis

Descriptive statistics were used to determine minimum, maximum, mean, and standard deviation values for reading and speaking tasks. In addition, a two-way ANOVA was run to find the effect of task and gender and the intercept of these independent variables on speech rate. A correlation study was done to find out the relationship between speaking and articulation rates in conversational speech and reading. As for silent intervals, descriptive statistics were used to determine pauses per minute, the total duration of these intervals for females and males, and correlations between these variables.

III. Results

The normality of the data was assessed using the Shapiro-Wilk test, which revealed that the data was normally distributed ($p = 0.492$). Equality of variance was assessed using Levene's test, which revealed that the homogeneity of data assumption was met ($p = 0.876$).

A. Overall Speech Rate Results

Summary statistics for the overall measurement results for speaking rate and articulation rate in SPM and WPM in both reading and spontaneous speech tasks are summarized in Table 1.

TABLE 1
MINIMUM, MAXIMUM, MEAN (M), AND STANDARD DEVIATION (SD) VALUES FOR SPEAKING RATE (SPM AND WPM) AND ARTICULATION RATE (SPM AND WPM) IN READING AND CONVERSATION TASKS FOR SYRIAN ARABIC SPEAKERS

		N	Minimum	Maximum	M	SD
Speech rates during reading	speaking rate SPM	65	199.5	354.3	288.7	33.5
	articulation rate SPM	65	259.3	399.6	336.5	30.8
	speaking rate WPM	65	70.4	127.3	103.8	11.9
	articulation rate WPM	65	91.5	144.4	121.4	10.4
Speech rates during conversation	speaking rate SPM	65	171.9	336.8	244.5	33.4
	articulation rate SPM	65	242.6	383.3	317.9	29.9
	speaking rate WPM	65	83.4	165.4	117.6	15.8
	articulation rate WPM	65	122.5	191.4	153.6	15.9

B. Male vs. Female Speakers

Table 2 shows a summary of the means and standard deviations of speech rate in conversation and reading in SPM and WPM. In reading tasks, females averaged 303.3 SPM, 108.8 WPM in speaking rate, and 344.7 SPM, 124.8 WPM in articulation rate. Males' averages were 273.7 SPM, 98.7 WPM in speaking rate and 328 SPM, 117.9 WPM in articulation rate. While in conversation tasks, females averaged 246.3 SPM, 120.1 WPM in speaking tasks and 312.3 SPM, 152.7 WPM in articulation rate. Males averaged 242.7 SPM, 115.1 WPM in speaking rate and 323.7 SPM, 154.5 WPM in articulation rate.

TABLE 2
MEAN (M), STANDARD DEVIATION (SD), AND STANDARD ERROR MEAN (SE) VALUES FOR SPEAKING RATE (SPM AND WPM) AND ARTICULATION RATE (SPM AND WPM) IN READING AND CONVERSATION TASKS FOR SYRIAN ARABIC SPEAKERS

		Gender	N	M	SD	SE
Reading task	speaking rate SPM	Male	32	273.7	33.0	5.8
		Female	33	303.3	27.3	4.8
	articulation rate SPM	Male	32	328.0	30.3	5.4
		Female	33	344.7	29.4	5.1
	speaking rate WPM	Male	32	98.7	12.1	2.1
		Female	33	108.8	9.7	1.7
	articulation rate WPM	Male	32	117.9	11.0	1.9
		Female	33	124.8	8.7	1.5
Conversational task	speaking rate SPM	Male	32	242.7	32.0	5.7
		Female	33	246.3	35.2	6.1
	articulation rate SPM	Male	32	323.7	28.6	5.1
		Female	33	312.3	30.4	5.3
	speaking rate WPM	Male	32	115.1	13.0	2.3
		Female	33	120.1	17.9	3.1
	articulation rate WPM	Male	32	154.5	15.6	2.8
		Female	33	152.7	16.5	2.9

Regarding the mean of speech rate for male and female speakers, females exhibited significantly higher speech rates in all reading tasks (SPM $F = 15.527$, d.f = 1, $p < 0.001$; WPM $F = 13.732$, d.f.=1, $p < 0.001$; articulation SPM $F = 5.079$, d.f. = 1, $p = 0.028$; and articulation WPM $F = 7.938$, d.f. = 1, $p = 0.006$). No significant difference between females and males was found in any of the measured rates in the speaking task.

C. Silent Intervals

Table 3 shows the means of the total duration of silent intervals and the number of pauses per minute—in addition to the correlations between these measures—for females, males, and all speakers in both reading and conversational tasks. In the reading task, the mean duration of pauses was 30.9 seconds with an average of 15.4 pauses per minute (females' duration averaged 23.5 seconds with 14.4 pauses per minute and males' duration averaged 38.6 seconds with 16.5 pauses per minute). The number of stops per minute is highly correlated with duration (0.84 for the total population, 0.75 for females, and 0.82 for males). In the conversation task, the mean duration of pauses was 27.9 seconds with an average of 19.7 pauses per minute (females duration averaged 25.5 seconds with 19.1 pauses per minute and males' duration averaged 20.4 seconds with 20.4 pauses per minute). The correlation between duration of pauses and number of pauses per minute in speaking rate was less than that of reading, although it was high (correlation was 0.68 for the total population, 0.73 for females, and 0.56 for males). Silent intervals for males were significantly higher ($F = 20.912$, d.f. = 1, $p < 0.001$) in comparison to females in the reading task. However, although noticeable, silent intervals for spontaneous tasks did not show a significant difference ($F = 2.987$, d.f. = 1 $p = 0.089$). Table 4 summarizes the ANOVA results of females and males regarding speaking rate in reading, spontaneous tasks, and silent intervals.

TABLE 3
FREQUENCY (PER MINUTE) AND DURATION (IN SECONDS) OF PAUSES ACROSS TASKS WITH THEIR CORRELATIONAL VALUES

	Reading			Conversation		
	Pauses/min	Duration (seconds)	Correlation	Pauses/min	Duration (seconds)	Correlation
Total	15.4	30.9	.84**	19.7	27.9	.68**
Females	14.4	23.5	.75 **	19.1	25.5	.73**
Males	16.5	38.6	.82**	20.4	30.5	.56**

** Correlation is significant at the 0.01 level (2-tailed).

TABLE 4
RESULTS OF TWO-WAY ANOVA COMPARING SPEAKING RATE (SPM AND WPM), ARTICULATION RATE (SPM AND WPM), AND SILENT INTERVALS IN READING AND CONVERSATION TASKS FOR SYRIAN ARABIC SPEAKERS

Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Speaking rate SPM	14214.6	1	14214.6	15.5	.000
Articulation rate SPM	4524.4	1	4524.4	5.1	.028
Speaking rate WPM	1646.1	1	1646.1	13.7	.000
Articulation rate WPM	773.4	1	773.4	7.9	.006
Silent intervals	115.090	1	115.1	20.9	.000
Speaking rate SPM	204.457	1	204.5	.2	.672
Articulation rate SPM	2142.525	1	2142.5	2.5	.122
Speaking rate WPM	404.916	1	404.9	1.6	.204
Articulation rate WPM	50.040	1	50.0	.2	.661
Silent Intervals	60.101	1	60.1	2.9	.089

D. Speech Rate in Different Tasks

Results from Tukey's HSD showed significant differences in speech rates (speaking and articulation) across conversation and reading tasks (d.f. = 3, $p < 0.001$).

Table 5 shows correlation results for speech rate in reading and conversation tasks. It appears that speech rate (SPM and WPM) and articulation rate (SPM and WPM) correlated well with each other in the reading task but not in the conversation task. However, the duration of pauses in reading and conversation had a relatively strong correlation (r = 608, $p < 0.001$). It is noticeable that speech rate in SPM is well correlated with pause duration in reading and conversation tasks. Articulation rate showed no correlation with pause duration in both reading and conversation tasks.

TABLE 5
CORRELATIONS BETWEEN PAUSES IN READING AND CONVERSATION SPEAKING RATE AND ARTICULATION RATE (SPM AND WPM) WITH P VALUES

	Pauses in reading	SR reading, SPM	AR reading, SPM	SR reading, WPM	AR reading, WPM	Pauses in conversation	SR conversation, SPM	AR conversation, SPM	SR conversation, WPM	AR conversation, WPM
Pauses in reading p value	1	-.685** .000	-.319** .010	-.673** .000	-.318** .010	.608** .000	-.367** .003	.122 .333	-.377** .002	.131 .297
SR SMP reading	-.685** .000	1	.894** .000	.991** 0.000	.885** .000	-.323** .009	.310* .012	.091 .473	.326** .008	.079 .532
AR SPM reading	-.319** 0.010	.894** .000	1	.885** .000	.961** .000	-.072 .570	.199 .112	.193 .124	.214 .087	.183 0.154
SR WPM reading	-.673** 0.000	.991** 0.000	.885** 0.000	1	.879** 0.000	-.320** 0.009	.306* 0.013	.090 .475	.315* .011	.070 .578
AR WPM reading	-.318** .010	.885** .000	.961** .000	.879** .000	1	-.054 .667	.176 .160	.180 .152	.186 .139	.163 .193
Pauses sp. speech	.608** .000	-.323** .009	-.072 .570	-.320** .009	-.054 .667	1	-.748** .000	.004 .975	-.668** .000	.092 .464
SR SPM sp. speech	-.367** .003	.310* .012	.199 .112	.306* .013	.176 .160	-.748** .000	1	.619** .000	.935** .000	.485** .000
AR SPM sp. speech	.122 .333	.091 .473	.193 .124	.090 .475	.180 .152	.004 .975	.619** .000	1	.636** .000	.891** .000
SR WPM sp. speech	-.377** .002	.326** .008	.214 .087	.315* .011	.186 .139	-.668** .000	.935** .000	.636** .000	1	.653** .000
AR WPM sp. speech	.131 .297	.079 .532	.183 .145	.070 .578	.163 .193	.092 .464	.485** .000	.891** .000	.653** .000	1

* Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

IV. DISCUSSION

This study aimed to establish preliminary data regarding the average speech rate in reading and conversation tasks among Syrian Arabic adult speakers. In addition, this study aimed to investigate gender differences in these rates. Speech rates were measured in speaking and articulation rates (SPM and WPM), through both a reading and a conversation task. In addition, pauses within these tasks were measured and reported in this study.

The only prior Arabic-language speech rate study is Damhoureyah et al. (2020) who investigated speech rate only in WPM in conversation and reading tasks in Jordanian Arabic speakers. Furthermore, a Jordanian Arabic study investigated participants almost in the same age group. In comparison to Jordanian Arabic speakers, revised literature discusses speech rate and its relationship to fluency (153.6 WPM vs. 142.83 WPM). However, Syrian Arabic speakers were slower than Jordanians in reading speech rate (103 WPM vs. 141.83 WPM) and in articulation rate (121.4 WPM vs. 161.83 WPM). This study's current results, which reveals differences in speech rates between Jordanian and Syrian dialects, are similar to findings from research conducted in other languages. Robb et al. (2004), for example, found that New Zealand English speakers spoke faster than American English speakers. Similarly, Jacewicz and Wei (2010) found that Wisconsin speakers of English were significantly faster than those from North Carolina.

Arabic is an Afro-Asian language with three different forms: 1. classical Arabic (as found in the Quran), 2. modern standard Arabic (which is the formal language found in most written forms of Arabic); and 3. colloquial Arabic (Najem & Marie, 2021). Modern standard Arabic exists always in the same form, but spoken Arabic has five main dialects—Hijazi (Arabian Peninsula and Yemen), Mesopotamian (Iraq), Levantine (Syria and Lebanon), Egyptian (Egypt and Sudan), and Maghribi (North African)—with vast differences between these dialects (Youssef, 2013). Differences in conversational speech rate between Jordanian spoken Arabic and Syrian spoken Arabic may be attributed to inter-dialectal differences. This supports the conclusion of Coats (2019) on the regional differences in rates within the same language. However, the noticeable difference in speech rates in reading tasks between Jordanian and Syrian spoken Arabic may

stem from different reasons. The reading task in the Jordanian study was not reported. The task in the present study involved a journal article, which may be a more complex read compared to the task in the Jordanian study. Further investigation of interdialectal differences in reading speech tasks may be needed using a standard reading text.

This study's findings regarding the speaking rate in Syrian Arabic reveals differences with other languages. Speech rate in the present study was found to be higher than that in Australian English in both reading and conversation tasks (Block & Killen, 1996) and higher than speech rate in SPM in American English in the reading task (Robb et al., 2004). However, the speech rate in the present study was found to be lower than that in Irish English in conversation tasks (Lee & Doherty, 2017), in American English in reading and conversation (Walker, 1988), in American English in reading (Robb et al., 2004), and in Turkish conversation and reading tasks (Cangi et al., 2020). It must be noted that languages vary in their speech rates due to differences in complexity and phonological patterns (Amino & Osani, 2015; Cangi et al., 2020; Trouvain & Möbius, 2014). Additionally, measuring speaking rates can involve various linguistic units of analysis, such as syllables per second, syllables per minute, and words per minute. Different methodologies for silent interval calculations can also be used. Some studies used 50 ms as the cutoff to calculate articulation rates (Rob et al., 2004; Plug et al., 2022), while others used 150 ms (Mahr et al., 2021; Redford, 2014). Thus, it is expected that studies aimed at examining different languages will show variances in speech rate.

It was found that Syrian Arabic speakers' speech rate in the reading task was higher than that in the conversation task. This is consistent with other studies targeting languages such as Turkish (Cangi et al., 2020; Girgin, 2008), American English (Jacewicz & Wei, 2010), and Irish English (Lee & Doherty, 2017). A possible explanation for these results may be that the cognitive effort for reading is lower compared to the effort for speaking. According to Bortfeld et al. (2001), conversation requires more planning and cognitive functioning in comparison to reading. Furthermore, Lee and Doherty (2017) found that pauses occurred more frequently in conversation than in reading, especially when answering questions. The present study's findings contradict Block and Killen (1996), who reported that Australian English speakers' reading was slower than their speaking, which they attributed to a dialectical difference.

The difference between speech rate in conversation and reading is also evident in the lack of correlation between speaking rate (SPM and WPM) and articulation rate (SPM and WPM), findings consistent with Damhoureyeh et al. (2020). On the other hand, in both conversation and reading tasks, the total duration of pauses correlates well with speaking rate but not with articulation rate. As discussed, articulation rate provides insight into articulatory behavior, whereas speaking rate is more influenced by pauses (Mahr et al., 2021).

The second purpose of this study was to determine whether speech rate varies by gender. Females and males showed no significant differences in conversation tasks, which aligns with other studies that reported insignificant differences in speech rate between genders (Block & Killin, 1996; Cangi et al., 2020; Robb et al., 2004; Walker, 1988).

The present study found a gender effect on speaking rate and articulation rate in reading and conversation, as females exhibited a significantly higher speech rate than males. Total pause duration was slightly higher in males than females in conversation, while the total pause duration in males was longer in reading, results which align with Kowal and O'Connell (1980) and Lee and Doherty (2017).

Robb et al. (2004) and Damhoureyeh et al. (2020) found no significant differences between males and females across conversation and reading tasks. The present study revealed a difference between males and females in speaking rate during reading, which shows that female speech rate was significantly higher than that of males. Faster speech rate in reading contradicts the results of other studies that found males had a slightly faster speaking rate in reading compared to females (Jacewicz & Wei, 2010). Lee and Doherty (2017) found that the speech rate in reading was higher in males than females in the second attempt at reading. The exact reasons behind the possible gender effect on speech rate is unclear (Lee & Doherty, 2017), although the gender-rate relationships may stem from anatomical and physiological changes (Hixon et al., 2008) or from sociolinguistic differences (Kendall, 2013). Given the small sample size of this study, further investigation is required to provide more insight into the gender/task effect in Syrian spoken Arabic.

V. Conclusion

This study offers preliminary normative data regarding the speech rate of adult Arabic speakers in Syria. The results of this study affirm that males and females differ in their speech rates, which may be useful in planning treatment for each group. The study results further affirm that speakers of different colloquial forms of a language differ in their speech rate.

Appendix

Translated List of subjects used for obtaining associated speech samples in spontaneous conversation.

1. Tell me about your life before you got accepted into the master's program.
2. Describe your hometown.
3. Tell me about your semester's subjects.
4. Tell me about what you do at the weekends.
5. Describe a typical week for you.
6. Tell me about the programs/series you watch. Or the last show you watched?
7. Tell me about the sport/hobby you are interested in.

8. Why do you like Latakia/Aleppo?
9. What are your plans for this coming summer?
10. What did you do last summer?

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