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Representation of Arabic Narratives in Digital Media - A Case Study

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Abstract

This case study aims to compare narratives written in digital media by Arabic native speaking teenagers in Israel. The data was collected from two schools in Kufr Qari' village in the Triangle region. Of these students, 35 were boys (45%) and 43 were girls (55%). The teenagers are of different ages (13, 15, 17 years old) who wrote stories in their preferred writing system (WS) used in digital media (Arabic, Arabic written with Roman alphabets, or Arabic written in Hebrew letters). Focusing on the macrostructure as well as the microstructure, we investigate differences in narratives among the different age groups across several skills as well as differences across the varied writing systems.

In analyzing the narrative texts, we applied several statistical models. All macro and micro element evaluations were compared across ages and language choices within a Generalized Linear Model (GLM) framework. The results show significance by age for the Macrostructures of goal and meta ending as they require deeper thinking skills. Moreover, WS affected the macro- and microstructure of the narrative. Producing a narrative in Arabic script burdened the teens due to the diglossic nature of the language and orthographic complexities. In Arabic script, the use of MSA nouns and verbs added to the quality of the macrostructure. In addition, girls tended to choose Arabic, whereas boys were more likely to choose Hebrew script. This may be ascribed to social factors. Finally, girls regularly generated more micro elements in parallel to the boys' micro-element production.

Keywords: Hebrew, Arabic, Narratives, digital media, story grammar

Narrative creation is a valuable instrument for building and transmitting ideas that involve complex linguistic, cognitive, and social competences (Duinmeijer et al., 2012; Sartwell, 2006; Tsimpli et al., 2016) .

The literature recognizes two levels of discourse in narratives: microstructure and macrostructure (e.g., Petersen et al., 2008). Macrostructure refers to the overall story structure whereas microstructure refers to the language deployed in storytelling.

There are no studies to our knowledge that have focused on narrative skills among Arab teenagers. Arabic, a diglossic language (Ferguson, 1959), is characterized by linguistic distance between the language of speech, in which narrative skills are first acquired, and the language of reading and writing, which is learned later, and in which written narratives are delivered (Kawar et al., 2019; Leikin et al., 2014; Ravid et al., 2014). Moreover, no studies have focused on narratives written in digital media .

The current study compares narratives written in digital media by native Arabic speaking teenagers of different ages (13, 15, 17 years old) who wrote stories in their preferred writing system used in digital media (Arabic, Arabic written in Latin script, or in Hebrew script). Focusing on the macrostructure as well as the microstructure, we investigate differences in storytelling among the different age groups across several skills as well as differences across the varied writing systems .

Macrostructure and Microstructure of Narratives

Narrative macrostructure or "Story Grammar" (SG; Stein & Glenn, 1979) delivers an organizational model for analyzing the macrostructure of narratives. SG includes setting, characters, and episodic structure (Botting, 2002; Paradis et al., 2011; Soodla & Kikas, 2010; Stein & Glenn, 1979; Trabasso et al., 1989; Westby, 2005).

Unlike macrostructure, the microstructure of narratives captures the linguistic aspects of the story. It illustrates the narrator's mastery of language structures, lexical, morphological, syntactic, and semantic features. Microstructural indices include measures of general productivity, e.g., number of utterances, number of words; syntactic complexity, e.g., mean length of utterance, morphology; and morpho-syntax, e.g., verbal tense/aspect, inflectional morphology, lexical knowledge, lexico-grammatical features, and linguistic content (Heilmann et al., 2016; Nippold et al., 2005; Rezzonico et al., 2016). Microstructural features can be language specific, even though marked developmental patterns in microstructural quality are found across languages (Berman, 2009).

In typically developing children, the number of story grammar elements included in oral narratives was found to grow with age. As such, children aged 4 to 4.6 years include a central theme and three SG components, initiating event, attempt, and outcome (Applebee, 1978); however, between the ages of 5 to 7 years they include at least five story grammar elements adding a setting and an ending. At around the age of 10, children can produce detailed reference to characters' internal responses (Bishop & Donlan, 2005) .

Moreover, microstructural skills start developing at an early age, and development is sustained well past the age of ten (Blankenstijn & Scheper, 2003). As they continue to develop, children produce longer narratives using more varied content words (Justice et al., 2006) and more complex syntactic structures (Berman & Nir-Sagiv, 2007). Hence, microstructure has served as an equipment for assessing linguistic skills in children. Macrostructure and microstructure capture different aspects of narrative production skills, yet research has shown that the two are related. According to cognitive-driven schema theory (Berman, 1988, 2008) and form-function approaches to language and narrative acquisition (Berman & Slobin, 1994), the development of narrative production depends on the combination of top-down cognitive processes to organize and connect story events (i.e., macrostructure) with bottom-up linguistic aspects to choose suitable lexical and morpho-syntactic structures in storytelling (i.e., microstructure). Recent studies have focused on the relations between various indices of

microstructure and changes in macrostructure (e.g. Heilmann et al., 2010; Mäkinen et al., 2014). Overall, they exhibit that expansion in narrative macrostructure capability involves changes in the way microstructural features are located within discourse functions, and that changing relations between micro- and macrostructure are informative indicators of narrative development. Understanding the relationship between microstructure and macrostructure is essential, especially as narrative production is a well-known predictor of children's language, literacy and academic achievement, in L1 (Pinto et al., 2016; Suggate et al., 2018.

Narrative Production in Arabic Diglossic Context

Arabic speaking children grow up in diglossia and acquire two varieties of the Arabic language: a spoken variety used for informal speech and a standard variety used mainly for reading and writing (Ferguson, 1959). The degree of exposure to the two varieties is different and children usually do not develop equal proficiencies in the two varieties, not even after years of schooling (Saiegh-Haddad & Schiff, 2016; Schiff & Saiegh-Haddad, 2018). The spoken and the standard varieties are surprisingly distant linguistically and this has been proven to be related to difficulties in developing linguistic and metalinguistic skills in the standard variety (see Saiegh-Haddad, 2018). The linguistic distance between SpA and StA was found to impact the acquisition of basic language and literacy skills in children (Khamis-Dakwar & Froud, 2012; Saiegh-Haddad, 2003, 2004, 2007; Saiegh-Haddad & Haj, 2018; Saiegh-Haddad et al., 2011; Saiegh-Haddad et al., 2020).

Standard Arabic (StA) has a writing convention; however, spoken Arabic (SpA) does not have one. The rapid progress in technology allowed spoken vernaculars to be written in digital media using different writing systems. As for Arabic dialects in Israel, for instance, they can be written using Arabic, Hebrew, or Latin scripts.

Digital Writing of Arabic

Herring (2007) notes that digital communication "provides an abundance of data on human behavior and language use" (p. 1). Thus, it is not surprising to observe the influence of the writing systems used in written digital narratives of Palestinian Israelis .

Digital devices have influenced the written colloquial forms of languages, in that people all over the world are communicating and developing new conventions for writing their indigenous spoken languages electronically. This phenomenon is predominant in diglossic languages, such as Arabic, Persian, Greek, and several languages of the Indian subcontinent such as Tamil, Sinhala, Telugu, and Bengali, since colloquial languages (the "low" register) are not usually written (Abu Elhija, 2014) .

It seems that the diglossic situation of the Arabic language has contributed to the birth of new forms of communication (Abu Elhija, 2012, 2014, 2017). The fact that Arabic speakers in Israel choose various scripts to write SpA (Arabic, Latin, and Hebrew scripts), even though the Arabic script is available for them almost all the time, raises interesting questions as to what motivates them to make such script choices (see Zoabi, 2012) .

In her study, Zoabi (2012) discussed the script choices on Facebook made by Palestinian Israelis and Arabs from other countries. She found that ideology education and religion affect script choice. For instance, people who have good proficiency in English tending to use Latinized script; while those who have a good proficiency in Hebrew tend to use Hebrew script more, due to more exposure to the language.

Objectives and Research Questions

It is enlightening to study narrative production in diglossic languages and the relationship between the language-based microstructure and the macrostructure elements to shed light on the relationship between linguistic skills and discourse organizational skills expressed in narrative production. Given the linguistic distance between the two varieties, yet the close structural overlap between them, it would be interesting to investigate whether diglossia-related lexical features of the narrative predict quality of the narrative at the macro

level. Moreover, our research examines how all the elements mentioned are reflected when using different writing systems to represent SpA.

The research questions for this study are as follows:

1. How are story grammar (SG) elements used by 13-, 15-, and 17-year-old teenagers?
2. Which SG elements are used in the different writing systems (WS)? And does the WS affect the use / amount of SG elements used?
3. How are microstructure elements represented among the different ages?
4. Which are microstructure elements represented and are there any differences among the stories written in the different writing systems?
5. Is there a difference in the level of micro and macro according to gender?
6. Is there a correlation between macro and micro values? And to check whether the micro values predict the macro or not?

We hypothesize that older teenagers will have better structure on both levels, macro and micro, and anticipate that there will be differences in micro and macro structure due to the use of the different writing systems. Due to the modality, we expect less wording which might affect the structure.

Methods

Participants

The data for this study was drawn from a sample of three ages: 13 years old (29 students, 37.2 %), 15 years old (23 students, 29.5%), and 17 years old (26 students, 33.3%). Of these students, 35 were boys (45 percent) and 43 were girls (55 percent). The data was text evaluated by multiple parameters, which were divided by macro and micro elements. Beyond age differences, the choice of WS was an additional factor. The majority, 39 students (50.0 %) chose Hebrew script, while 23 (29.5 percent) chose Arabic and the remaining 16 (20.5 percent) chose Latin Script. Across 13 years old, the choice of WS was relatively balanced, that is, Arabic: 37.9 percent, Hebrew script 31.0 percent, Latin script 31.0 percent. However, WS choice switched among older students, who choose Hebrew script for the text writing: 56.5 percent among 15 years old, and 65.4 percent among 17 years old, while only one student chose Latin Script among the latter (Pearson's χ^2 test for age X language dependency: χ^2=10.80, df=4, p=.029).

Table 1

General Information of the Data and Participants

Age by years	N	Percentage	Gender		Writing System		
			Male	Female	Arabic	Hebrew	Latin
13	29	37.2%	14	15	11	9	9
15	23	29.5%	12	11	4	13	6
17	26	33.3%	9	17	8	17	1
Total	78	100%	35 (45%)	43(5%)	23(29.5%)	39 (50.0%)	16 (20.5%)

Pearson's χ^2 test for age X language dependency: χ^2=10.80, df=4, p=.029

Procedure

In analyzing the narrative texts, we applied several statistical models. All macro and micro element evaluations were compared across ages and WS choices within a Generalized Linear Model (GLM) framework. The GLM procedure allows the response variables to take

various distribution forms. In the case of macro elements, a binary response (1 if the element appeared in the text and zero if not) was applied with the Binomial distribution and the Logit link. A complete count of these macro elements (Total Macro) was analyzed as a discrete response with the Poisson distribution and the log-transformed link. To assess age and WS choice differences, a multiple pairwise comparisons were used subject to the Bonferroni correction. This means that each predicted marginal mean of age or WS choice was compared to the other categories to generate post-hoc marginal mean ranking, where marginal means were the predicted sub-group means. We used Latin letters to mark the ranking of each category from the lowest ("a") and on. For the micro elements, we used the Poisson distribution and a similar post-hoc ranking method. In the latter modeling step, we added gender effect in addition to age and WS choice. For significance test, the Wald's χ^2 statistics was used. Next, to explore possible relationships between macro and micro elements, we calculated the overall correlation coefficients and the within age correlations for the micro elements with the total macro element. Due to the binary scale of the macro elements, the Spearman's correlation coefficients were calculated rather than the Pearson's.

Results

Table 2 shows age and WS choice effects on the various macro elements, by which the text was appraised. The binomial modeling means that predicted marginal means were the probability to use a specific macro element. Results show that the presence of goal in the text increased its probability by age (Wald=7.63, p<.05), such that the predicted probability to include the goal was higher among 17-year-old in comparison to 13-year-olds. WS choice showed an effect on the presence of goal. The probability to include goal was the highest among Hebrew script users in comparison to Arabic users, while users of Latin Script predicted probability did not differ from both. The ending element appeared at different ratios across the different WS (Wald=8.00, p<.05). Specifically, Hebrew script users showed the highest probability to include ending, while Arabic script users showed the lowest predicted probability to include this element. Meta ending difference was tested across ages only (Wald=6.69, p<.05). The highest probability for that element to appear in the text was found among the 17 age and the lowest among the 13-year-old, that is, older students applied this meta-ending at a higher rate in comparison to the younger students. The appearance of meta ending was non-zero among Hebrew script users, but only Arabic user included meta ending and none of the Latin script users did. Thus, the WS effect was not assessed for this macro-element. The total macro element was a count across the seven macro elements. No difference in that count was found between ages (means by age varied from 4.6 to 4.9 macro elements among students in the same age), yet WS choices differed (Wald=6.15, p<.05), Specifically, the highest number of produced macro elements was found among Hebrew script users (predicted marginal mean=5.49) and the lowest was among Arabic script users (predicted marginal mean=4.09). As mentioned in the method section, gender effect was insignificant across all macro elements. The division between boys and girls was similar across all ages (χ^2=1.74, df=2, p=.420). However, girls tended to choose Arabic script (46.5 percent), whereas boys were more likely to choose Hebrew script (65.7 percent) (χ^2=13.39, df=2, p=.001).

Table 2

Macro Structure of Narrative by Age

	Setting	Initiating Event	Goal	Attempt	Outcome	Ending	Meta Ending	Total macro

Model	Binomial	Binomial	Binomial	Binomial	Binomial	Binomial	Binomial	POISSON
Age								
Wald	2.81	0.03	7.63*	0.61	0.41	3.22	6.69*	0.84
Marginal Means								
13 y	.83 (.07)	.79 (.08)	.38[a] (.10)	.88 (.06)	.91 (.05)	.87 (.06)	.11[a] (.11)	4.59 (0.40)
15 y	.70 (.10)	.80 (.09)	.47[ab] (.12)	.87 (.08)	.86 (.08)	.63 (.12)	.31[ab] (.13)	4.38 (0.44)
17 y	.61 (.11)	.77 (.10)	.82[b] (.09)	.94 (.06)	.87 (.08)	.79 (.10)	.65[b] (.12)	4.93 (0.48)
WS								
Wald	0.03	4.82	9.00*	2.85	2.47	8.00*	-	6.15*
Marginal Means								
Arabic	.73 (.10)	.66 (.10)	.38[a] (.11)	.92 (.06)	.77 (.09)	.56[a] (.11)	-	4.09[a] (0.43)
Hebrew	.72 (.07)	.90 (.05)	.80[b] (.07)	.95 (.04)	.90 (.05)	.91[b] (.05)	-	5.49[b] (0.38)
Latin	.70 (.13)	.75 (.12)	.50[ab] (.14)	.79 (.11)	.93 (.07)	.75[ab] (.12)	-	4.40[ab] (0.55)
AICC	34.44	30.67	35.77	30.15	32.08	30.18	14.70	302.48

Note: Latin letters for marginal mean ranking from the lowest ("a") and on; Standard errors in parentheses; * $p<.05$.

Table 2 (two parts) shows GLM results for the micro elements. These elements were the counts of relevant sentences and words in the produced text. The Poisson distribution was applied to these outcome counts. We included the same two main effects of age and writing system choice and added the gender main effect as an additional factor. These effects were tested independently on each micro element outcome. Results show that element means differed one from another across ages, except the count of SPA verbs. The 17-year-old students produced more micro elements of all types, on average, except SPA verbs. However, the ranking of the other age means was not as consistent. Some micro elements counts did not differ, on average, between 13 and 15 year-olds: total number of words (tokens); number of MSA words (tokens); number of SPA words (tokens); number of MSA words (types); number of MSA verbs; total number of verbs; and root types. Overall the number of sentences was the smallest, on average, among 15-year- old students, yet this predicted mean value for the 13-year-olds did not differ from both the 15 and the 17- year-old. The total number of words (type) was the lowest among the youngest students, 13- years old, and was significantly smaller than that mean count of the 15 years old, while the highest mean value was found among the 17 years old. A switch in the ranking was found in roots (tokens), where the lowest mean was found among the 15 years old, and the mid-level mean value was found among the youngest 13 years old. Significant writing system choice differences were found across all micro element counts. However, the post-hoc ranking of these differences was not as consistent as across ages. In some elements, the highest means were found among those students who chose Hebrew script for the writing assignment: total number of sentences; total number of words (tokens);

number of MSA words (tokens); number of MSA words (types); and number of MSA verbs. The micro-element counts of Hebrew script users was the lowest, on average, in number of words (types); SPA words (tokens); SPA words (types); SPA verbs; total number of verbs; roots (tokens); and roots (types).

Students who chose Arabic script for the writing assignments did not perform significantly better than users of either Hebrew or Latin scripts. Their micro-element counts were either the lowest or similar, on average, in comparison to students who adopted Hebrew or Latin scripts for the assignment. Latin script users showed the highest counts, on average, in number of words (types); number of SPA words (tokens); number of SPA words (types); roots (types). We included gender effect and found that except in number of MSA words (types), number of MSA verbs, and number of verbs, girls consistently produced more micro elements in comparison to the boys' micro-element production.

To determine macro-micro relationships, we calculated Spearman's correlation coefficients. Table 3 presents these correlation coefficients. Consistent relationships were found between most micro elements and macro goal and meta ending. For the former, number of SPA words (tokens), number of SPA words (types), SPA verbs, and roots (tokens and types) were uncorrelated with the presence of goal. All other micro elements were positively correlated with the presence of goal. As for meta ending, except for SPA words (tokens), SPA words (types), SPA verbs and total number of verbs, positive correlations were found between the micro elements and the meta ending. Slightly less consistent were the correlations of the micro elements and the initiating event score, where number of MSA words (tokens and types) and roots (tokens and types) were uncorrelated with initiating events. Correlations between micro- elements and the macro attempt were like these correlations with goal, however, to a lower extent, namely, correlation coefficients were below .30, which means that a proxy to the shared variance was below ten percent ($.30^2 = .09$). None of the micro-elements were found to correlate with macro setting and outcome, while MSA words (tokens and types) were positively correlated with macro ending, yet to a lower degree.

Table 3

Descriptive Statistics and GLM Results for Micro-Structure of Narrative by Age, WS, and Gender

	Qq1 Number of sentences	Qq2 Numbers of TOTAL words (tokens)	Qq3 Number of words (Types)	Qq4 Number of MSA words (tokens)	Qq6 Number of SPA words (tokens)	Qq5 Number of MSA words (TYPES)	Qq7 Number of SPA words TYPE
Descriptive							
Means	6.26	59.36	47.22	16.37	42.97	14.24	35.78
SD	3.38	33.86	27.61	19.84	28.47	16.91	20.60
Minimum	2	19	12	0	0	0	0
Maximum	20	196	134	102	178	80	118
Model	POISSON	POISSON	POISSON	POISSON	POISSON	POISSON	POISSON
Age							
Wald	14.53***	173.22***	259.98***	83.71***	82.58***	61.89***	61.62***
Marginal Means							
13 y	5.87^{ab} (0.45)	51.13^{a} (1.33)	35.82^{a} (1.11)	5.12^{a} (0.44)	41.05^{a} (1.18)	4.63^{a} (0.41)	34.20^{a} (1.08)
15 y	4.61^{a} (0.45)	50.25^{a} (1.51)	42.86^{b} (1.41)	4.69^{a} (0.43)	40.05^{a} (1.38)	4.38^{a} (0.41)	33.77^{a} (1.27)
17 y	7.26^{b} (0.60)	76.86^{b} (1.99)	68.38^{c} (1.92)	8.19^{b} (0.68)	57.48^{b} (1.76)	7.23^{b} (0.62)	47.31^{b} (1.59)
WS							
Wald	11.26**	13.71**	28.74**	479.07***	201.26***	417.56***	148.76***
Marginal Means							
Arabic	4.78^{a} (0.46)	53.45^{a} (1.54)	43.21^{a} (1.39)	3.93^{b} (0.41)	49.73^{b} (1.50)	3.51^{b} (0.39)	39.92^{b} (1.34)
Hebrew	6.97^{b} (0.43)	59.43^{b} (1.26)	44.03^{a} (1.08)	27.30^{c} (0.89)	32.03^{a} (0.92)	23.85^{c} (0.83)	27.45^{a} (0.85)
Latin	5.90^{ab} (0.65)	62.16^{b} (2.14)	55.19^{b} (2.06)	1.83^{a} (0.36)	59.32^{c} (2.10)	1.75^{a} (0.35)	49.87^{c} (1.92)

AICC	385.69	1552.88	1288.70	870.20	1415.78	781.15	1078.09
Gender							
Wald	4.85*	45.13***	36.91***	4.63*	43.83***	3.19	14.63***
Marginal Means							
Male	5.08[a] (0.42)	50.94[a] (1.34)	41.19[a] (1.20)	5.39[a] (0.45)	38.81[a] (1.20)	4.93 (0.42)	34.38[a] (1.13)
Female	6.33[b] (0.41	63.51[b] (1.29)	51.55[b] (1.16)	6.12[b] (0.48)	50.47[b] (1.16)	5.52 (0.45)	40.53[b] (1.04)

Note: *** p<.001, ** p<.01, * p<.05; Latin letters for marginal mean ranking from the lowest ("a") and on; Standard errors in parentheses.

Continued Table 3

Descriptive Statistics and GLM Results for Micro-Structure of Narrative by Age, WS, and Gender (Cont.)

	Qq10 Number of MSA verbs	Qq9 Number of SPA verbs	Qq8 Number of verbs (Total)	Qq11 Roots tokens	Qq13 Root Types
Descriptive					
Means	9.04	9.45	18.50	24.81	17.23
SD	6.64	6.88	10.25	21.22	13.77
Minimum	1	0	5	2	0
Maximum	32	45	55	128	75
Model	POISSON	POISSON	POISSON	POISSON	POISSON
Age					
Wald	31.31***	5.10	21.88***	54.57***	35.12***
Marginal Means					
13 y	7.46[a] (0.51)	9.02 (0.55)	16.91[a] (0.77)	36.36[b] (1.30)	15.64[a] (0.71)
15 y	6.66[a] (0.54)	10.91 (0.73)	17.73[a] (0.91)	11.29[a] (0.54)	16.14[a] (0.88)
17 y	10.99[b] (0.74)	10.64 (0.74)	22.59[b] (1.07)	42.26[c] (1.80)	22.88[b] (1.13)
WS					

Wald	22.82***	52.44***	9.32**	502.08***	381.55***
Marginal Means					
Arabic	6.65[a] (0.54)	11.45[b] (0.73)	18.03[ab] (0.90)	22.87[a] (0.86)	25.27[b] (1.08)
Hebrew	10.32[b] (0.53)	6.91[a] (0.43)	17.40[a] (0.68)	22.72[a] (1.05)	7.42[a] (0.43)
Latin	7.96[a] (0.76)	13.24[b] (0.97)	21.60[b] (1.25)	33.38[b] (1.36)	30.79[c] (1.54)
AICC	583.28	578.44	737.87	888.32	624.48
Gender					
Wald	1.84	9.80**	1.63	19.69***	10.02**
Marginal Means					
Male	8.72 (0.56)	8.64[a] (0.57)	18.10 (0.82)	22.38[a] (0.93)	15.86[a] (0.78)
Female	7.80 (0.45)	11.27[b] (0.55)	19.51 (0.72)	28.45[b] (0.89)	19.46[b] (0.73)

Note: *** p<.001, ** p<.01, * p<.05; Standard errors in parentheses; Latin letters for marginal mean ranking from the lowest.

To determine micro-macro relationships, we calculated Spearman's correlation coefficients. Table 4 presents these correlation coefficients. Consistent relationships were found between most micro elements and macro goal and meta ending. For the former, number of SPA words (tokens), number of SPA words (types), Spa verbs, and Roots (tokens and types) were uncorrelated with the presence of goal. All other micro elements were positively correlated with the presence of goal. As for meta ending, except for SPA words (tokens), SPA words (types), SPA verbs and total number of verbs, positive correlations were found between the micro elements and the meta ending. Slightly less consistent were the correlations of the micro elements and the initiating event score, where number of MSA words (tokens and types) and roots (tokens and types) were uncorrelated with initiating events. Correlations between micro elements and the macro attempt were like these correlations with goal. However, to a lower extent, namely, correlation coefficients were below .30, which means that a proxy to the shared variance was below ten percent (.302 = .09).
None of the micro elements were found to correlate with macro setting and outcome, while MSA words (tokens and types) were positively correlated with macro ending, yet to a lower degree.

Table 4
Spearman's Correlations between Micro-Structure of Narrative and Macro Measurements (n=78)

		Setting	Initiating Event	Goal	Attempt	Outcome	Ending	Meta Ending
		Qq0	Q1	Q2	Q3	Q4	Q5	Q6
Qq1	Number of sentences	.12	.27*	.36**	.24*	.21	.21	.37***
Qq2	Numbers of TOTAL words (tokens)	.05	.30**	.36**	.23*	.21	.16	.29**
Qq3	Number of words (Types)	.004	.26*	.33**	.23*	.13	.10	.37***
Qq4	Number of MSA words (tokens)	-.11	.20	.47***	.22*	.11	.24*	.53***
Qq6	Number of SPA words (tokens)	.14	.23*	.10	.12	.18	.03	-.03
Qq5	Number of MSA words (TYPES)	-.10	.20	.47***	.22*	.11	.25*	.54***
Qq7	Number of SPA words TYPE	.13	.24*	.06	.11	.17	.02	-.02
Qq10	Number of MSA verbs	.04	.23*	.42***	.18	.16	.17	.34**
Qq9	Number of SPA verbs	.14	.18	-.04	.15	.17	.003	-.09

Qq8	Number of verbs (Total)	.12	.27*	.24*	.22*	.21	.11	.16
Qq11	Roots tokens	.12	.08	-.04	.08	.14	-.06	-.21
Qq13	Root Types	.09	.03	-.09	.05	.11	-.10	-.27*

Note: *** p<.001; ** p<.01; * p<.05.

A finer correlation analysis is shown in Table 5, in which the Spearman's correlations were divided by ages. In the macro element side, we used for simplicity the aggregated value across the seven macro elements (total count of macro element appearances). Across ages, SPA words (tokens and types), SPA verbs, and roots (tokens and types) were uncorrelated using aggregated count of macro elements. Number of sentences, total number of words, MSA words (tokens and types), and MSA verbs were all positively correlated with the aggregated macro element, consistently across all three age groups, while only the number of words (types) was uncorrelated with the aggregated macro element among those 13 years old.

Table 5

Spearman's Correlations between Micro-Structure of Narrative and Aggregated Macro Elements by Ages

		total N=78	13 y N=29	15 y N=23	17y N=26
Qq1	Number of sentences	.52***	.55**	.61**	.43*
Qq2	Numbers of TOTAL words (tokens)	.47***	.40*	.53**	.41*
Qq3	Number of words (Types)	.42***	.11	.53**	.43*
Qq4	Number of MSA words (tokens)	.50***	.39*	.50*	.48*
Qq6	Number of SPA words (tokens)	.22	.27	.15	.16
Qq5	Number of MSA words (TYPES)	.50***	.37*	.51*	.49*
Qq7	Number of SPA words TYPE	.20	.20	.17	.15
Qq10	Number of MSA verbs	.46***	.44*	.43*	.41*
Qq9	Number of SPA verbs	.13	.16	.20	.09
Qq8	Number of verbs (Total)	.39***	.34	.38	.35
Qq11	Roots tokens	.02	.05	-.10	.05
Qq13	Root Types	-.07	-.02	-.15	-.07

Note: *** p<.001; ** p<.01; * p<.05.

Discussion

This study aims to first test, the effect of age, writing system and gender on narrative macrostructure. Second, the effect of age, writing system and gender on microstructure elements. Third, to test the relationship between narrative micro- and macro structure.

To test macrostructure among Arabic-speaking teenagers, we addressed macro structure elements of SG. In addition, we addressed general micro-structure features of text length number of tokens, text length number of types, type\token ratio, number of sentences, number of MSA words tokens, number of MSA word types, number of SPA words tokens and number of SPA word types.

In macrostructure level**,** writing systems differed. Specifically, the highest number of produced macro elements was found among Hebrew script users and the lowest was among Arabic users. In other words, Hebrew script users produced more than five elements, while Arabic users produced four elements out of the seven. Gender effect was insignificant across all macro elements. However, girls tended to choose Arabic, whereas boys were more likely to choose Hebrew script. This may be attributed to social factor. Boys go out/ work in Jewish cities, they also present themselves as young men who are independent and travel alone with friends and can communicate in Hebrew. However, girls read more Arabic novels in general, and they use Arabic more at their homes and cities.

Similarly, no difference was found between ages. This finding of the advantage of Hebrew writing system compared with Arabic writing system in macrostructure may be attributed to two basic factors.

First, it is generally suggested that diglossia's nature in Arabic has a negative impact on the acquisition of basic linguistic skills (Ibrahim et al., 2007). Children learn to extract knowledge and to express themselves in their standard written form which is different from the spoken one. Second factor is the specific orthographic complexity of Arabic (Asaad & Eviatar, 2013; Ibrahim et al., 2002; Saiegh-Haddad & Schiff, 2016). Arabic orthography challenge reading and language skills compared to Hebrew (Al Ghanem & Kearns, 2015).

Moreover, we propose that typing in Arabic writing system places considerable cognitive demands on children, as such, while typing in Arabic, children are aware of the importance of producing StA rather SpA, shifting between the two forms. We propose that in order to use StA lexical forms properly, children must inhibit SpA forms. In addition, children have to show cognitive flexibility and to shift between SpA and StA. Therefore, this process may impede macrostructure in Arabic writing system, while in using Hebrew script, they are aware that it is acceptable to use only SpA forms, the one they are proficient in. Accordingly, the co-occurrence of diglossia and specific Arabic orthographic complexity makes it difficult for Arab learners to produce narrative in a language such as Arabic, preferring to produce high quality narrative in less complex language such as Hebrew.

In Latin script the result was (.14) which is closer to Arabic, this is because Latin has a deep orthography for example, the following vowels o/u/ou/ e/i/ee/ei/ie can be used by Arabic speakers to represent the same vowel sound as digital writings are not standardized. This can potentially distract the writer from the content sometimes. One student for example wrote the word <futit> and <futet> "I entered" once with an <i> and the other time with <e> to represent the same vowel.

Thus, the results of the present study confirm a previous hypothesis stating that, compared with Hebrew, Arabic writing system poses a challenge to basic linguistic skills (Ibrahim et al., 2007; Saiegh-Haddad, 2003) such as producing narrative.

Even though the results indicate that the total of Macro structure elements are non-significant for age effect, the results for goal and meta ending are significant. This is because they require deeper thinking skills compared to the other SG elements that are relatively fixed and are acquired at an early age. The result related to "goal" structure falls in line with theoretical explanations of the order of emergence of story schema (e.g., Applebee, 1978; Stein & Glenn, 1979) that set goal-based narratives at later stages of narrative development (Khan et al., 2016).

As to microstructure, regarding age, the 17-age produced more micro elements of all types, on average, except SPA verbs. These findings imply that, in addition to general linguistic indicators, narrative microstructure ability in Arabic has age-related differences. These results align with earlier research demonstrating age-related differences in narration and showing the development of narrative microstructure (e.g., Berman & Slobin, 1994; Bishop & Donlan, 2005). In this case, narrative skills are acquired over time along a developmental continuum marked by increasing lexical level features (Petersen et al., 2010).

In case of gender effect, we found that except in number of MSA words (types), number of MSA verbs, and number of verbs, girls consistently produced more micro elements in comparison to the boys' micro-element production. This finding is explained by the fact that girls read more (Clark, 2012; White, 2007).

The findings indicate that in some micro element counts of Hebrew script users was the lowest, on average, in number of words (types); SPA words (tokens); SPA words (types); SPA verbs; total number of verbs; roots (tokens); and roots (types). This is plausible, because students who chose to write in Hebrew script, do not spend much effort on diglossic effect; therefore, their writing was more direct to express the ideas and content, thus affecting the number of micro- structure elements.

As to the relationship between narrative micro- and macro structure, across ages, SPA words (tokens and types), SPA verbs, and roots (tokens and types) were uncorrelated to the general macrostructure elements. However, indexes like number of sentences, total number of words, MSA words (tokens and types), and MSA verbs were all positively correlated with the general macrostructure, consistently across all age groups, while only the number of words (types) was uncorrelated with the general macro element among the 13 age. Narrative length by total number of word tokens represents language productivity and was found as related factor to macrostructural quality in previous studies (Heilmann et al., 2010). It is noteworthy that the frequency of use of MSA word forms and verbs is a positive parameter that correlated to narrative macrostructure. This finding indicates that, in addition to general microstructure parameters, narrative macro structure ability in Arabic benefits from high proficiency in MSA, which represented by frequency of use of MSA words and verbs.

According to the form-function approach to narrative acquisition (Berman & Slobin, 1994), we assume that selecting appropriate MSA words in narrative demands high cognitive effort from adults who usually don't use these forms in their daily speech. It seems that fluency or high skill in retrieval of the MSA words forms (and shifting from SPA to MSA) enable them to pay more attention to organize and sequence the narrative, and to promote macro structure features. It appears that Arabic narration is impeded by diglossia, selecting, and using MSA forms rather than SpA ones (in microstructure level) may promote macro structural quality, thus adults who success to manage shifting between the two forms, produce better macrostructure.

Conclusion

Overall, the results point to the impact of writing system on narrative macro- and microstructure. It seems that choosing Arabic script challenges children while producing narrative. More specifically, in Arabic script, the frequency of use of MSA word forms and verbs promote narrative macrostructure quality. The co-occurrence of diglossia and specific orthographic complexity of Arabic explain the current results.

Limitations and Implications

Several limitations must be addressed in the current study. First, future efforts utilizing a longitudinal design and following the sample from lower to higher ages will strengthen our understanding of the development of narrative macrostructure and microstructure among Arabic speakers. A second limitation of the present study is the small sample size which impedes generalization of our findings.

The results of the current study point to potential implications for promoting narrative macrostructure skills in Arabic, focusing on the importance of enriching oral and written narratives specially in StA, which may enhance their narrative competence. We suggest exposing children from early stages to StA and supporting their learning of narrative language. For instance, instruction in teaching narratives should focus on using StA words.

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