Arabic Verb Patterns and Macrostructure in Adolescent Narratives: A Comparative Analysis Across Writing Systems

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Received March 1, 2025; Revised May 16, 2025; Accepted May 27, 2025

Abstract. The aim of the study is **t**o explore verb patterns within narrative structures among Arabic-speaking adolescents using different writing systems – Arabic script, Romanized Arabic, and Hebrew script. It examines how these scripts influence the complexity and variety of verb usage, highlighting linguistic challenges in a multilingual educational context. Analyzed narratives from 78 students across three grade levels (7th, 9th, and 11th) using a mixed-methods approach. This included evaluating narrative macrostructure and analyzing verb usage, focusing on frequency, type, and token. Verbs were categorized by semantic features such as agentivity, transitivity, and tense to understand their role in narrative construction across different scripts. Hebrew script users displayed more complex verb patterns and higher macrostructural scores compared to peers using Arabic or Romanized Arabic scripts. There was a significant positive correlation between the diversity of root types used in Arabic script and narrative complexity, highlighting the impact of linguistic depth on narrative quality. A preference for eventive and transitive verbs was observed across all writing systems, with past tense verbs predominantly influencing narrative structuring. Writing system choice significantly impacts narrative verb patterns in a diglossic environment. Hebrew script is less cognitively demanding, suggesting the need for educational strategies to enhance narrative skills and support linguistic adaptability across scripts in multilingual settings.

Keywords: *narrative, writing systems, macrostructure, verb patterns, Palestinian Arabic.*

Таллас-Магаджна Найла, Елгіджа Дуа. Арабські дієслівні моделі та макроструктура в наративах підлітків: порівняльний аналіз різних систем письма.

Анотація. Метою дослідження є вивчення дієслівних моделей у наративних структурах серед арабськомовних підлітків, які використовують різні системи письма — арабську, латинську та іврит. Дослідження аналізує, як ці системи письма

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East European Journal of Psycholinguistics, 12(1), 226–265. https://doi.org/10.29038/eejpl.2025.12.1.tal

впливають на складність і різноманітність вживання дієслів, висвітлюючи лінгвістичні проблеми в багатомовному освітньому контексті. Проаналізовано розповіді 78 учнів трьох класів (7, 9 та 11) з використанням змішаного методу. Це включало оцінку макроструктури розповіді та аналіз вживання дієслів, зосередившись на частоті, типі та символі. Дієслова було класифіковано за семантичними ознаками, такими як активність, перехідність та час, щоб зрозуміти їхню роль у побудові розповіді в різних письмах. Користувачі івритського письма продемонстрували більш складні дієслівні моделі та вищі макроструктурні показники порівняно з однолітками, які використовували арабське або латинізоване арабське письмо. Було виявлено значущу позитивну кореляцію між різноманітністю типів коренів, що використовуються в арабському письмі, та складністю оповіді, що підкреслює вплив мовної глибини на якість оповіді. У всіх системах письма простежено перевагу подійних та перехідних дієслів, причому дієслова минулого часу переважно впливали на структурування розповіді. Вибір системи письма значно впливає на дієслівні моделі оповіді в диглосичному середовищі. Іврит є когнітивно легшим, що вказує на необхідність освітніх стратегій для покращення навичок розповіді та підтримки мовної адаптивності в різних системах письма в багатомовних середовищах.

Ключові слова: *розповідь, системи письма, макроструктура, дієслівні моделі, палестинська арабська мова.*

Introduction

As a cornerstone of language acquisition and literacy development, narrative development is essential for the articulation of complex ideas and requires advanced linguistic, cognitive, and social abilities (Hickmann, 2004; Uccelli & Paez, 2007). It includes two discourse levels: microstructure, which includes the language details used in storytelling and macrostructure, which is the overall narrative framework (Westby, 2005). There is still a dearth of study on Arab teens' narrative skills. Narrative development faces distinct challenges due to the phenomenon of diglossia in Arabic, which is characterized by a significant variance and a lack of an agreed orthographic representation for spoken language. In parallel, standard Arabic has a formal written language (Saiegh-Haddad, 2003; Walters, 2007). Furthermore, the understudied emergence of digital media as a narrative platform has left a gap in the literature concerning current linguistic study (Taguchi et al., 2013; Baron, 2010).

Narrative production is a cognitively demanding activity involving memory, linguistic organization, and perspective-taking, and it is particularly complex in multilingual and diglossic contexts (Berman & Slobin, 1994; Hickmann, 2004; Westby, 2005). It encompasses both macrostructural elements, such as goal, setting, and outcome—and microstructural components like syntactic complexity and verb morphology (Uccelli & Paez, 2007). In diglossic languages such as

Arabic, narrative construction is further complicated by the dual-language processing demands of Standard Arabic (StA) and Spoken Arabic (SpA). Writers must navigate not only lexical and syntactic variation but also the cognitive shift between linguistic registers, which can constrain coherence and expressive richness. In addition, the rise of digital platforms has introduced new modes of script choice and orthographic expression, enabling adolescents to compose narratives in Arabic using Hebrew or Latin scripts. These platforms reshape narrative practices by reducing orthographic constraints, increasing reliance on SpA, and altering the cognitive load associated with text production (Baron, 2010; Herring, 2007). The current study examines how these variables, e.g. diglossia, digital script choice, and cognitive processing, intersect to influence the narrative performance of Arabic-speaking adolescents.

Research on other diglossic languages supports the notion that digital media transforms narrative expression by offering orthographic and structural flexibility. For instance, in Persian, writers commonly blend standard Persian with colloquial forms in Romanized script, circumventing formal conventions to enhance expressive immediacy (Tobbi, 2024). Similarly, Greek digital users often shift between katharevousa (formal) and demotic (informal) varieties, with script variation and code-switching used to signal social identity and genre (Androutsopoulos, 2006). These examples from other diglossic settings illustrate how digital platforms enable narrative practices that deviate from traditional linguistic norms, thereby fostering new forms of written fluency and creativity. This broader perspective contextualizes the current study of Arabic digital narratives within the global phenomenon of digitally mediated storytelling in diglossic environments.

This study looks at stories that native Arabic-speaking adolescents from different grade levels (7th, 9th, and 11th) wrote in digital media using their favorite writing system (Hebrew, Arabic written in Latin script, or Arabic written in Arabic). Our study looks at both the macrostructure and the microstructure, comparing how different grade groups, writing styles, and verb patterns differ in their narrative composition.

Macrostructure and Microstructure of Narratives

Macrostructure and microstructure represent two distinct but interrelated levels of narrative organization. Macrostructure refers to the global organization of a story, including elements such as setting, initiating event, internal response, goal, attempts, and resolution (Stein & Glenn, 1979). It reflects the narrative's coherence and completeness. Microstructure, by contrast, involves the linguistic

surface features that shape narrative fluency, including lexical diversity, syntactic complexity, cohesion markers, and grammatical accuracy (Justice et al., 2006; Berman & Nir-Sagiv, 2007). While developmental models in English suggest a progression from basic narrative schemas toward more elaborated and hierarchically structured stories (Westby, 2005), these trajectories may not map neatly onto Arabic. Arabic's diglossic nature where Standard and Spoken varieties differ in syntax and lexicon complicates the acquisition of cohesive narrative forms. Moreover, Arabic's rich morphological structure and nonlinear orthographic conventions introduce processing demands that differ from alphabetic systems like English. Therefore, while prior cross-linguistic findings offer a useful comparative lens, we approach them critically, recognizing that Arabic-speaking adolescents may exhibit unique developmental patterns in both macro- and microstructural domains of narrative.

The narrative microstructure of a story involves the narrator's mastery of lexical, morphological, syntactic, and semantic elements, and includes measures such as morphology, morpho-syntax, verbal tense/aspect, inflectional morphology, lexical knowledge, number of utterances, words, syntactic complexity, and mean length of utterance (Heilmann et al., 2016; Nippold et al., 2005; Rezzonico et al., 2016). These features show developmental patterns that can be language-specific (Berman, 2009).

As children grow, their use of story grammar (SG) components increases, notably between ages 4 to 7, where they begin to include elements like setting and ending, central theme, initiating event, attempt, and outcome (Applebee, 1978). By age 10, children can reference inner thoughts in narratives (Bishop & Donlan, 2005), with microstructural skills continuing to develop thereafter (Blankenstijn & Scheper, 2003). Younger children create longer narratives with more varied content words and complex syntax (Justice et al., 2006; Berman & Nir-Sagiv, 2007).

Microstructure serves as a tool for evaluating children's linguistic abilities and is interrelated with macrostructure. The development of narrative production involves combining top-down cognitive processes (macrostructure) with bottom-up linguistic aspects (microstructure) (Berman, 1988, 2008; Berman & Slobin, 1994). Research indicates the interaction between microstructure and macrostructure indices and how changes in microstructure affect narrative macrostructure (Heilmann et al., 2010; Mäkinen et al., 2014). Understanding this correlation is essential, given its link to children's language, literacy, and academic success in their first language (Pinto et al., 2016; Suggate et al., 2018).

While previous studies have established the foundational constructs of narrative macrostructure and microstructure (e.g., Stein & Glenn, 1979;

Westby, 2005), critical divergences exist in how these dimensions are operationalized across developmental and linguistic contexts. For instance, Westby emphasizes the developmental trajectory of story grammar acquisition, whereas Justice et al. (2006) focus on linguistic indices as diagnostic tools, potentially underemphasizing the narrative coherence aspect. Similarly, Berman and Nir-Sagiv (2007) suggest that syntactic complexity increases with age, but this perspective largely stems from monolingual populations and does not account for diglossic or multilingual conditions where such development may be nonlinear or script-dependent. Furthermore, many studies employ elicitation methods based on wordless picture books or structured retells (e.g., Heilmann et al., 2016), which may not fully capture the spontaneous linguistic choices made in digital narratives. These methodological limitations highlight the need for research that explores narrative development across both macro- and micro-levels in naturally occurring digital contexts, particularly in languages such as Arabic, where orthographic and register complexity may significantly influence performance.

Narrative Production in Arabic Diglossic Context

Arabic is a prototypical example of diglossia, a sociolinguistic phenomenon where two distinct varieties coexist within a single speech community, each serving different functional roles (Ferguson, 1959; Albirini, 2016). Standard Arabic (StA) is the high variety, associated with formal education, writing, and official discourse. It is morphologically complex, syntactically rigid, and often acquired through schooling rather than home exposure. In contrast, Spoken Arabic (SpA) comprises various vernacular dialects used in everyday conversation, which are less standardized, more phonetically transparent, and typically acquired as the first language. The two varieties differ significantly in phonology, morphology, syntax, and lexicon, and are often not mutually intelligible in written form. From a narrative production perspective, this separation presents challenges: StA is expected in formal written narratives, but most adolescents have greater fluency in SpA, leading to interference, register mixing, or code-switching, particularly in digital contexts where normative constraints are relaxed. Understanding this sociolinguistic dynamic is crucial for interpreting narrative competence in Arabic-speaking youth.

Children who speak Arabic are raised in a diglossic environment, learning two dialects: spoken Arabic (SpA) for casual conversation and standard Arabic (StA) for writing and reading (Ferguson, 1959). Due to differences in exposure, children typically do not achieve equal proficiency in both dialects, even after

years of education (Saiegh-Haddad and Schiff, 2016; Schiff & Saiegh-Haddad, 2018).

The linguistic gap between SpA and StA is significant, with the standard variety posing challenges for developing linguistic and metalinguistic skills (Saiegh-Haddad, 2018). This gap affects children's acquisition of literacy and basic language skills (Khamis-Dakwar & Froud, 2012; Saiegh-Haddad, 2003, 2004, 2007; Saiegh-Haddad & Haj, 2018; Saiegh-Haddad et al., 2011; Saiegh-Haddad et al., 2020).

Spoken Arabic (SpA) lacks a writing convention in contrast to Standard Arabic (StA). The swift advancement of technology has made it possible to write spoken vernaculars in digital media using various writing systems. In Israel, for example, Arabic dialects can be written in Arabic, Hebrew, or Latin scripts. (see A9 in Appendix)

Digital Writing System of Arabic

Digital communication reveals much about language use and human behavior (Herring, 2007). Palestinian Israelis' written digital narratives are influenced by the writing systems they use. As people globally create new electronic writing conventions for their native languages, digital devices impact written colloquial forms, a phenomenon prevalent in diglossic languages like Arabic, Persian, Greek, and languages of the Indian subcontinent (Abu Elhija, 2014).

The diglossic nature of Arabic has partly driven the emergence of new communication modes (Abu Elhija, 2012, 2014, 2017). An interesting question arises regarding why Arabic speakers in Israel choose different scripts (Arabic, Latin, and Hebrew) to write in spoken Arabic (SpA), despite constant access to the Arabic script (Zoabi, 2012). Zoabi's (2012) study of Facebook script choices among Arabs from various nations and Palestinian Israelis found that script choice is influenced by religion, ideology, and education. For instance, those proficient in English often use Latinized script, while those proficient in Hebrew frequently use Hebrew script due to greater exposure.

Verb Patterns in Spoken Arabic

Arabic, being a Semitic language, uses morphological structure to encode the semantic relationship between verbs. Arabic verbal systems are composed of patterns that vary primarily in terms of transitivity and morphosemantic class (Laks, Hamad, & Saiegh-Haddad 2019). Table 1 based on Tallas-Mahajna et al. (2023) and illustrates how morphological affixes increase pattern complexity

and how a rise in morphological complexity allows for a rise in semantic complexity.

Table 1
Morphological Complexity and Semantic Features and Affixes of he Verb Patterns

Pattern	**Morphological affix**	**Semantic affix / feature**
CaCaC	None	various, unmarked
CaCCaC	medial gemination	Causative
Ca:CaC[1]	vowel lengthening	Conative[2]
ʔaCCaC	ʔa- prefix	Causative
tCaCCaC	t- prefix + medial gemination	Reflexive/medio-passive[3]
tCa:CaC	t- prefix + vowel lengthening	Reciprocal
inCaCaC	in- prefix (n- prefix)	Medio-passive
iCtaCaC	i+ta circumfix (-ta- infix)	Reflexive intransitive
iCCaCC	final gemination	Inchoative of colors
istaCCaC	ista- prefix (sta- prefix)	reflexive transitive
CaCCaC[4]	additional medial consonantal slot	No semantic affix

The most fundamental verb pattern, *fa'al*, is this simple pattern *CiCeC* / *CaCaC*; it is the least complex pattern in terms of morphological complexity. It is composed of two templates, *a-a* and i-e, with different vowel patterns. The more common type of *a-a* pattern, *CaCaC*, denotes an action carried out by an agent; it can be transitive (e.g., *katab* 'write') or intransitive (e.g., *qaʕad* 'sit'). The *i-e* pattern *CiCeC* e.g., *xiser* 'lose' functions as an inchoative verb (Laks, Hamad, & Saiegh-Haddad 2019). This basic pattern is made more complex by the morphological elements that build upon it. A consonant may be doubled, a vowel may be extended, or consonants or entire syllables may be appended as complexifying elements. These modifications to *fa'al* are referred to as *morphological affixes* in this context. With each addition, the resulting pattern becomes more morphologically complex than the original pattern.

[1] The vowels between the root consonants, which the basic pattern *CaCaC*, may become prosodically unnecessary and drop, as in this pattern: *ʔaCCaC* (not **ʔaCaCaC*). For a theory on the prosodic constraints on the Semitic verb and nouns patterns, see McCarthy 1981.

[2] The conative function: engages the Addressee (receiver) directly and is best illustrated by vocatives and imperatives, e.g., "Tom! Come inside and eat!"

[3] Consider (a) *The glass was broken* vs. (b) *The glass broke*. Sentence (a) involves an agent, and the meaning is thus passive; sentence (b) involves no agent, and the meaning is thus medio-passive. In Arabic both meanings may be conveyed by either /inkasar/ whereas /tkassar/ only conveys the medio-passive meaning.

[4] This pattern *fa'lal* is reserved to four-consonant roots, e.g., *daḥraj* 'to roll'.

However, these morphological affixes in the verb system are by no means trivial linguistic elements. They frequently relate to an elaboration of the meaning. Here, the extra meaning elements are referred to as *semantic affixes*. Non-singletons exhibit the strongest correlation between morphological and semantic affixes (Levie et al. 2020), that is, in sets of verbs (two or more) with distinct verb patterns but derived from a single consonantal root. Derivational relations, primarily seen in transitivity alternations and other forms of semantic relations, exist between same-root verbs in diverse patterns, like [±stative] or [±eventive] versus [±agentive] and [±causative]; as well as feature like [±inchoative], [±reflexive], and [±reciprocal] (see Fassi Fehri, 1994; Glanville, 2011; Guerssel & Lowenstamm, 1996; Hallman, 2006; Jastrow, 2004; Ouhalla, 2014; Ryding, 2005; Younes, 2000; Wittig, 1990; among others).

The current study compares narratives written in digital media by adolescents who are native Arabic speakers and are in different grades (7th, 9th and 11th). The adolescents chose to write their stories in Arabic, Arabic written in Latin script, or Hebrew script, depending on which writing system they preferred. Our investigation focuses on both the macrostructure and microstructure, examining variations in narrative composition among age groups and across diverse writing systems and verb patterns.

Study Questions

Research Question 1: How does the writing system impact the macrostructure of narrative among students in different grade levels?
Research Question 2: what is the relationship between the macrostructure and the use of verb patterns?
Research Question 3: How does the use of verb tense, semantic features of verbs, and verb patterns correlate with the system among different grade levels?

Methods

Participants

The data for this study was drawn from a sample of three Arabic school grades in north Israel: 7th grade (29 students, 37.2 %), 9th grade (23 students, 29.5%), and 11th grade (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 grade level 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 script and the remaining 16 (20.5 percent) chose Latin Script. Across 7th grade, 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 9th grade, and 65.4 percent among 11th grade, 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 2
General Information of the Data and Participants

Grade	N	Percentage	Gender		Writing System		
			Male	Female	Arabic	Hebrew	Latin
7th	**29**	**37.2%**	**14**	**15**	**11**	**9**	**9**
9th	**23**	**29.5%**	**12**	**11**	**4**	**13**	**6**
11th	**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

Participants were randomly selected from a pool of middle and high school students in the same geographic region. All participants were reported by their schools to be typically developing students with no history of language, learning, or cognitive difficulties. Their general language proficiency in Arabic was considered age-appropriate, based on school performance and teacher reports.

Narrative elicitation took place across two sessions. In each session, students watched a silent 5-minute video depicting scenes of unresolved interpersonal conflict (e.g., a fight in school, exclusion by peers). Immediately after viewing, they were asked to write a narrative inspired by the video, reflecting on a similar situation or constructing an imagined conflict scenario. Students used their mobile phone Notes application to compose their texts, in line with their habitual digital writing practices. They were given the freedom to choose the dialect (Spoken or Standard Arabic) and script (Arabic, Latin, or Hebrew) that felt most natural to them. This method allowed for the collection of spontaneous digital narratives in an ecologically valid format reflective of their daily communication habits.

Data Analyses

All analyses were conducted in R (R Core Team, 2012).

RQ1. First, to test the impact of WS and Grade on total macrostructure score, a two-way ANOVA analysis was performed. Next, to test the effects of WS and Grade on the use of individual SG elements, a Generalized Linear Mixed Models (GLMM) analysis with Binomial distribution was performed with WS, Grade, and SG as fixed factors and Participant as the random factor. Importantly, we tested interactions of SG and the other fixed factors, since we were interested in understanding whether WS and Grade had a different impact across SG elements. To test the significance of each fixed factor and of interactions, Likelihood Ratio Tests were performed using ANOVA function with the values of AIC, BIC, logLik, deviance, Chi-square, and p. The first model included SG factor, followed by WS, SG*WS interaction, Grade, SG*Grade interaction, WS*Grade interaction, and finally the three-way SG*WAS*Grade interaction.

RQ2. To test the relationship between performance on macrostructure and the use of verbal patterns[5], correlation analyses were performed between the total macrostructure score, verbal tokens and types in standard and spoken varieties.

RQ3. To test whether students used different tenses and whether it was related to WS and/or Grade, we ran a GLMM analysis with Poisson distribution with WS, Grade, and Tense as fixed factors and Participant as the random factor.

To test the effect of WS on semantic features of verbal patterns, a series of GLMM analyses were performed separately for Agentivity (stative/eventive), Transitivity (transitive/intransitive), and Semantic features (Inchoative, causative, reflective, reciprocal). In each analysis, features were tested in interaction with WS and Grade aiming to examine whether the different features were affected by WS and/or Grade. GLMM analyses with Poisson distribution were chosen to explore the use of raw frequencies. Moreover, Verb-pattern was analyzed for the effects of WS, Grade, and their interactions using GLMM analyses with Poisson distribution.

For ANOVAs, the *aov* function was used along with the *EtaSq* function for the amount of explained variance. Gor GLMMs, the *glmer* function from the *lme4* package was used (Bates et al., 2014). Models were tested using Likelihood Ratio Tests which included AIC, BIC, logLok, deviance, chi-square, and p-values. For these analyses a single participant who used an English WS in 11th grade was excluded.

The full list of the parameters resulting from testing all fixed factors are included in the Tables in Appendix. The package *emmeans* (Lenth, 2019) was used

[5] ifa'all and tfa'lal were never used and excluded from the analyses.

to conduct post-hoc analyses of interaction effects in GLMMs**.** The package *sjPlot* (Lüdecke, 2021) was used to plot the predicted values based on the results.

Results

To contextualize the quantitative findings and gain a deeper understanding of both the macrostructural organization and the students' orthographic choices in narrative construction, the appendices include authentic sample narratives drawn from the research dataset. These examples—presented in Arabic script, Romanized Arabic (Latin script), and Hebrew-script Arabic—offer insight into the diverse ways students' express conflict-based stories within digital environments. Reviewing these samples (see Appendices A9–A11) allows for a closer examination of how narrative structure, linguistic features, and script preference interact, providing a deep understanding the numerical analysis.

RQ1: How does the writing system impact the macrostructure of narrative among students in different grade levels?

Table 3 presents means and standard deviations of the total macrostructure score per grade and WS.

Table 3
Means and Standard Deviations of Total Macrostructure Score

Grade	Arabic N=23	English N=16	Hebrew N=39
7th	4.18 (1.33)	5.00 (1.41)	5.56 (1.01)
9th	4.25 (1.71)	4.00 (1.55)	5.23 (1.36)
11th	4.63 (1.85)	3.00 (only one)	6.06 (1.09)

A two-way ANOVA with WS and Grade as independent variables revealed a significant main effect of WS, $F(2,71)=7.94$, $p<.001$, $\eta^2=.15$. Post-hoc analyses with Tukey corrections showed that texts in Hebrew got higher scores than texts in Arabic ($p=.001$) and then texts in English ($p=.03$), and the difference between Arabic and English was not significant ($p=.84$). To test whether WS affected the use of individual SG elements across grades and whether these effects differed across SG elements, a GLMM analysis was applied. It revealed a significant main effect of SG, $\chi2 = 130.69$, $p < .001$ of WS, $\chi2 = 20.29$, $p < .001$, and a significant SG*WS interaction, $\chi2 = 26.83$, $p = .01$. The SG*Grade interaction was also significant, $\chi2 = 27.84$, $p < .001$. The effect of Grade, $\chi2 = 1.85$, $p = .17$, WS*Grade interaction, $\chi2 = 2.13$, $p = .35$, and SG*WS*Grade interaction, $\chi2 = 11.82$, $p = .62$,

were not significant. The resulting parameters for each model are included in Table 1A in Appendix. The two significant interactions were explored using the *plot_model* function (see Fig. 1 and 2).

Figure 1
Predicted Probability of Producing SG Elements in theTthree WS

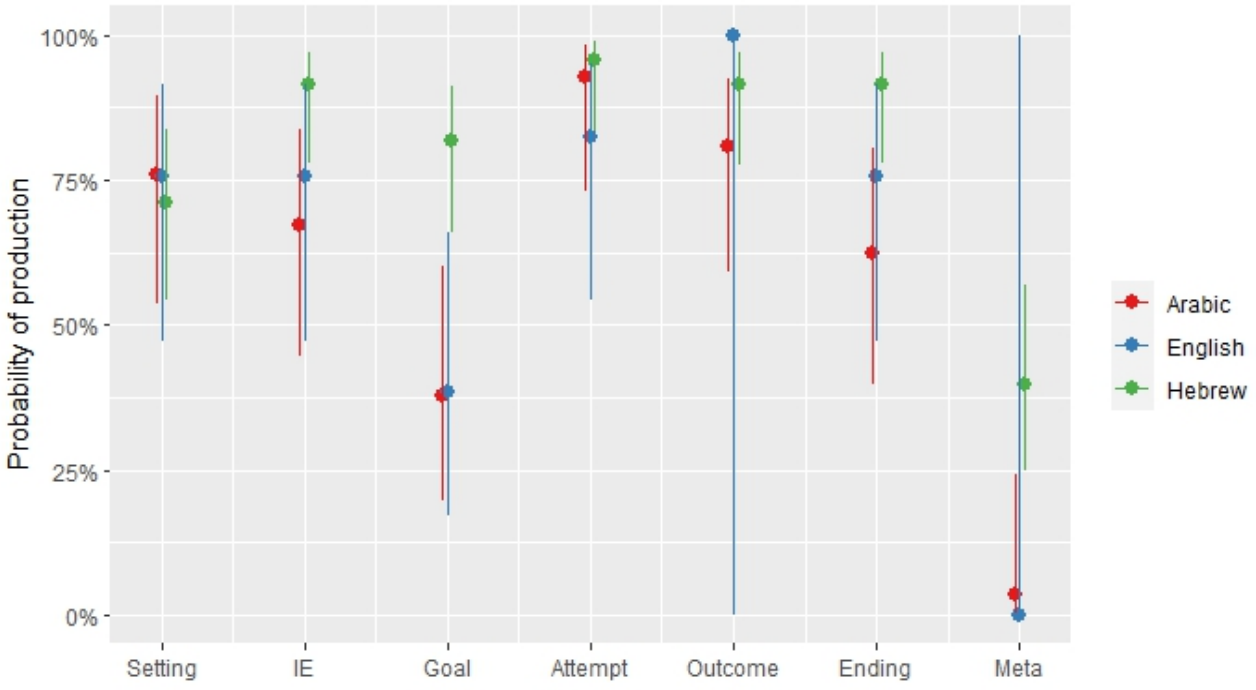
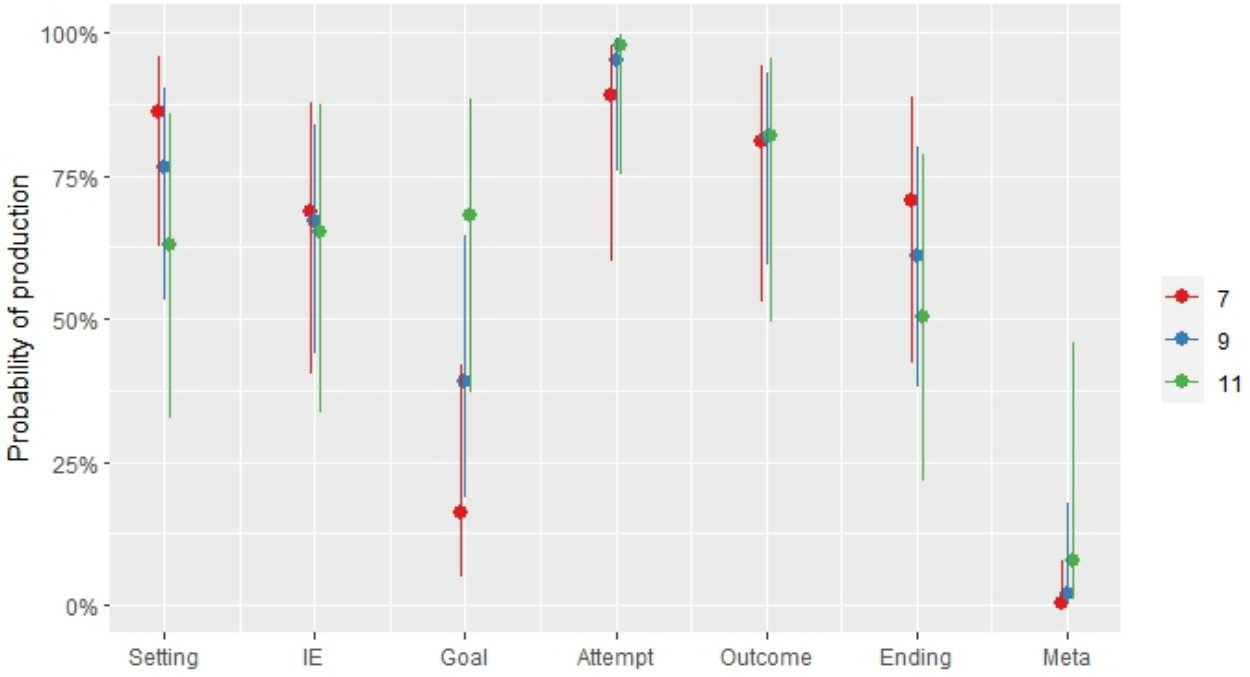


Figure 1 shows that probability to produce the following SG elements was high: Setting, IE, Attempt, and Outcome. In these SG elements, the three WS did not differ much. However, in the more challenging SG elements, such as Goal and Ending, Hebrew showed higher predicted probability. Meta ending was produced by very few participants. Figure 2 shows that, again, Goal was one of the challenging elements and it was mainly produced by older students from the 11th grade.

Figure 2
Predicted Probability of Producing SG Elements by Grade



RQ2: what is the relationship between the macrostructure and the use of verb patterns? Pearson correlation analyses were performed between frequencies of verbal tokens and types and the total macrostructure score. The analyses revealed a significant positive correlation only between macrostructure score and root types in Arabic WS, r=0.45, p=.04. All other correlations were not significant (see Table 2A).

RQ3. How does the use of verb tense, semantic features of verbs, and verb patterns correlate with the system among different grade levels?

Verb Tense:

Table 3 shows frequencies and percentages of the use of verbs in three tenses – Past, Present, and Passive.

Table 4
Means and Standard Deviations of Verb Frequencies and Percentages in Present, Past, and Passive Forms.

	Arabic N=23						**English N=16**						**Hebrew N=39**					
	Past		Present		Passive		Past		Present		Passive		Past		Present		Passive	
Grade	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*	***N***	*%*
7th	8.00 (2.76)	70	3.33 (2.66)	29	.09 (.31)	1	9.67 (6.56)	72	4.56 (5.46)	25	0.44 (0.73)	3	10.67 (3.54)	74	4.22 (4.06)	26	0	0
9th	6.00 (3.16)	59	3.75 (1.71)	41	0	0	8.67 (4.50)	65	4.33 (3.67)	34	0.17 (0.41)	1		64		35		1
11th	6.43 (3.05)	56	5.71 (3.55)	44	0	0							9.59 (2.94)	77	3.18 (2.79)	23	0	0

**imperative was used only once and was excluded

Table 4 shows that the majority of verbs were used in the Past tense, but it occurred mainly in the 7th and the 9th grade. To test whether Tenses were used depending on WS and Grade, we ran a GLMM analysis. The analysis revealed a significant effect of Tense, $\chi 2 = 832.81$, $p < .001$ and a significant interaction of Tense*WS, $\chi 2 = 13.30$, $p = .04$. The effect of WS, $\chi 2 = 1.84$, $p = .40$, of Grade, $\chi 2 = 853.93$, $p = .61$, were not significant. The model testing a three-way interaction of Tense*WS*Grade failed, due to a large number of 0 in the Passive tense when split into WS and Grade. The full results of the Likelihood Ratio Tests are included in Table 3A in Appendix.

Figure 3
*Frequency of Verbs Predicted by the Tense*WS Interaction*

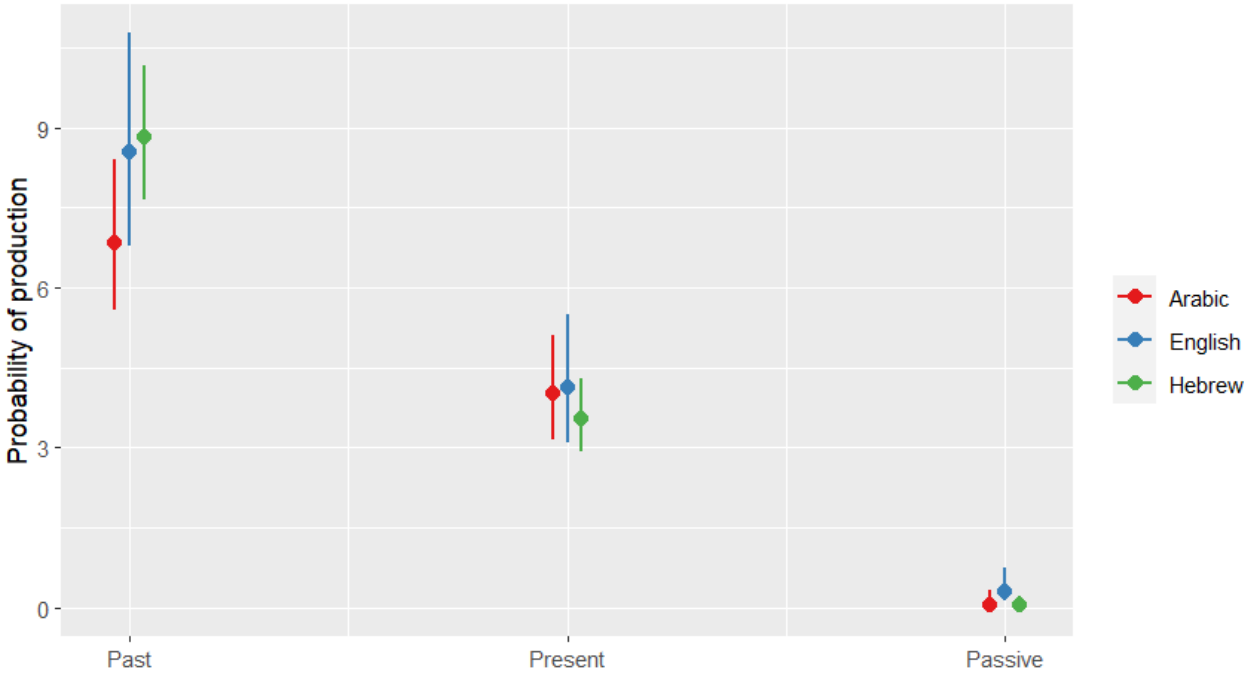


Figure 3 displays the predicted frequencies of verbs based on the interaction factor, and shows that the Past tense was used most frequently in all WSs and the Passive forms were the least frequent. Past was used more frequently in English and Hebrew WS, and Passive was more frequent in English. We tested the interaction using post-hoc analysis with Tukey corrections. The analysis failed to reveal significant results of pairwise comparisons in all WS.

Verb Semantic Features

In this section, verbs were coded according to three classifications: stative vs. eventive verbs; transitive vs. intransitive verbs; and inchoative vs. causative vs. reflexive verbs and reciprocal.

Stative vs. eventive. Table 5 shows raw frequencies and percentages of stative and eventive verbs in each WS per grade.

Table 5

Means and Standard Deviations of Verb Frequencies and Percentages of Stative and Eventive Verbs

	Arabic N=23				**English N=16**				**Hebrew N=39**			
	Stative		**Eventive**		**Stative**		**Eventive**		**Stative**		**Eventive**	
Grade	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***
7th	5.18 (2.44)	50	5.00 (1.79)	50	5.44 (3.47)	43	7.22 (5.31)	57	5.78 (2.95	43	7.79 (3.31)	57
9th	4.50 (3.42)	40	5.00 (2.16)	60	5.33 (3.32)	41	7.22 (5.31)	59	5.44 (2.70)	44	7.22 (2.77)	56
11th	5.43 (2.76)	45	6.43 (2.94)	55	2.00	33	4.00	67	4.94 (2.56)	38	7.88 (3.16)	62

To test the effect of WS across grades on the frequency of stative and eventive verbs, a GLMM analysis was performed with WS, Grade and Agentively as fixed factors and Participant as the random factor. The analysis revealed a significant effect of Agentivity, $\chi 2 = 18.59$, $p < .001$. students used more eventive than stative verbs. None of the interactions which were tested came out significant (see Table 4A in the Appendix). Thus, students in all grades and independent of WS used more eventive than stative verbs.

Transitive vs. Intransitive

Table 6 shows raw frequencies and percentages of transitive and intransitive verbs in each WS per grade.

Table 6
Means and Standard Deviation of Verb Frequencies and Percentages of Transitive and Intransitive Verbs

	Arabic N=23				**English N=16**				**Hebrew N=39**			
	Transitive		**Intransitive**		**Transitive**		**Intransitive**		**Transitive**		**Intransitive**	
Grade	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
7th	6.73 (2.24)	68	3.27 (1.95)	32	7.67 (4.64)	61	4.89 (3.37)	39	8.33 (2.12)	67	4.33 (2.35)	33
9th	5.75 (2.63)	59	3.75 (1.50)	41	8.83 (0.98)	73	4.00 (3.52)	27	8.08 (3.30)	68	3.69 (1.44)	32
11th	8.43 (4.43)	70	3.43 (0.98)	30	2.00	33	4.00	67	7.29 (3.44)	56	5.53 (2.43)	44

Similar to agentivity, GLMM analysis revealed a significant effect of transitivity, $\chi 2 = 72.83$, $p < .001$, however, effect of WS, nor interaction of WS and transitivity were not significant (see Table 4A).

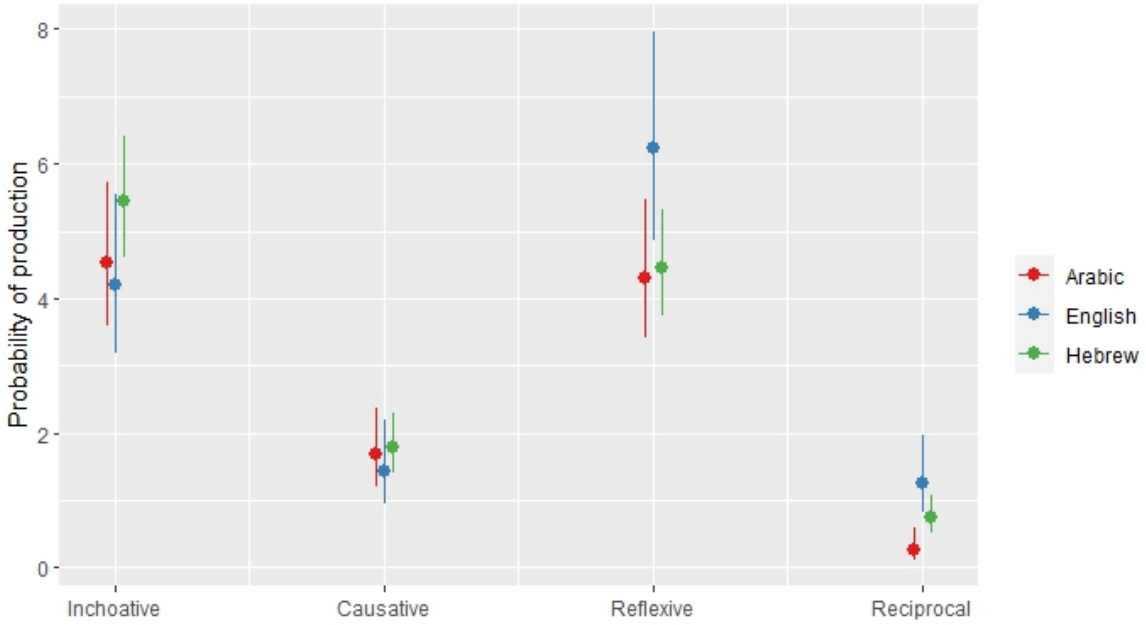
Inchoative, Causativity, Reflexivity, Reciprocity

Table 6A (see Appendix) shows means and standard deviations of verbs by four semantic categories.

To test the effect of WS on semantic properties of verbs, a GLMM analysis revealed a significant effect of semantic category, $\chi 2 = 387.09$, $p < .001$, a significant semantic category*WS interaction, $\chi 2 = 21.58$, $p = .01$, and a significant Semantic category*Grade interaction, $\chi 2 = 23.37$, $p < .001$. The three-way interaction of Semantic category*WS*Grade was not significant, $\chi 2 = 8.00$, $p = .40$ (see Table 5A for the results of the Likelihood Ratio Tests). For the *Mean (and standard deviation) of verb frequencies and percentages of Inchoative, Causative, Reflexive, and Reciprocal*, see Table 6A in the appendix.

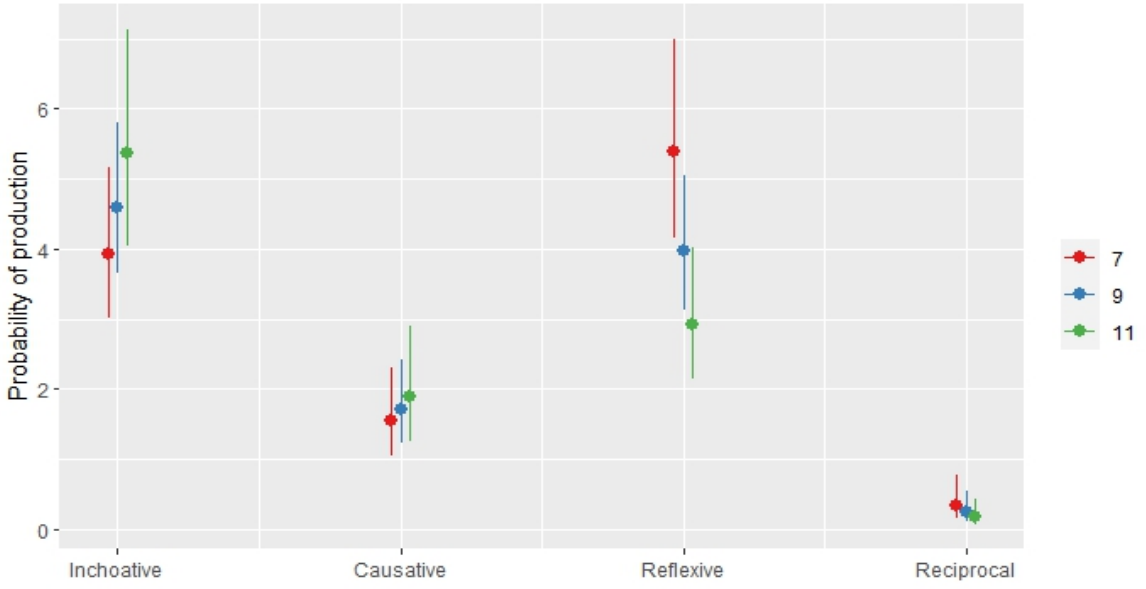
The significant interactions are displayed in Figures 4 and 5. To explore the interactions, post-hoc analyses with Tukey corrections were performed. For the Semantic category*WS interaction, the post-hoc analyses revealed that students used Reciprocal verbs more in English WS than in Arabic (p=.002) and in Hebrew more than in Arabic (p=.05). In the Reflexive verbs students used more of this category in English WS than in Arabic or Hebrew, but the significance was not reached after the corrections (p=.08 and p=.07 respectively).

Figure 4
Predicted Probability of Producing Verbal Patterns by Semantic Category



For the Semantic category*Grade interaction, the post-hoc analyses revealed that for the Reflexive category students used more patterns in the 7th grade than in the 9th grade (p<.001) and more than in the 11th grade (p=.002). The rest of the comparisons did not produce significant results after Tukey adjustments were applied.

Figure 5
Predicted Probability of Producing Verbal Patterns by Semantic Category



Verb Pattern

Figure 6
Percent of Verbal Types by Pattern in All Grades by WS

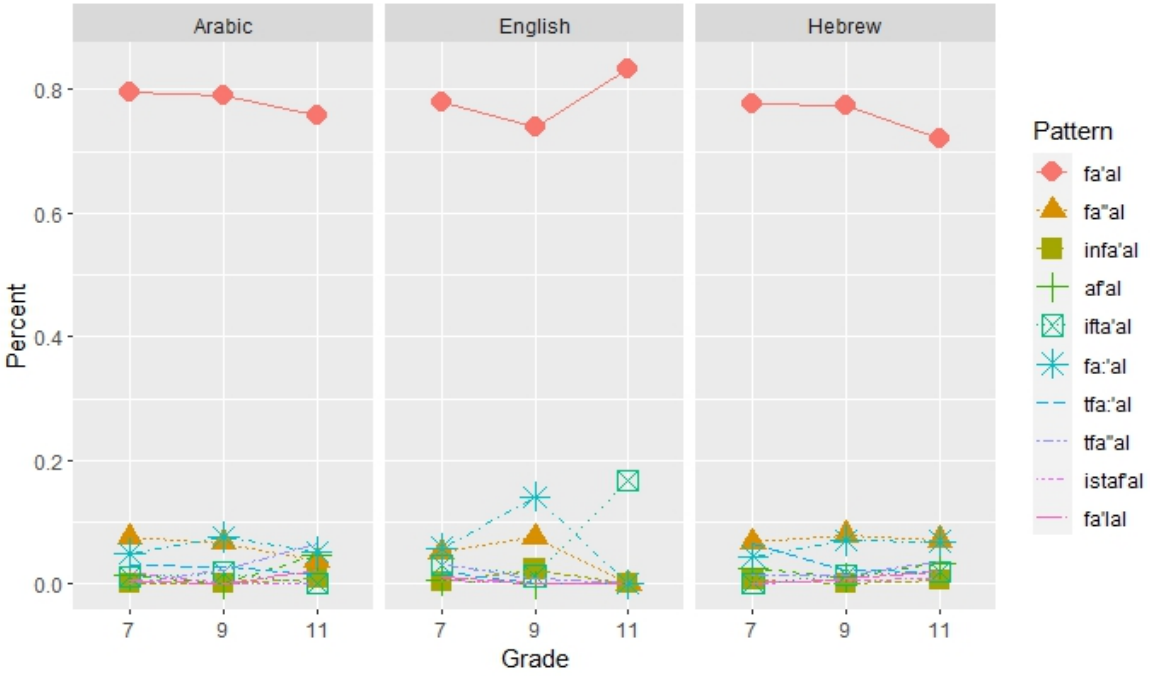


Figure 6 displays the percent of verbs used in each WS by pattern, shows that fa'al was the most frequent pattern in all grades and WSs. To examine whether the frequency was affected by WS, Grade, and their interaction, GLMM analysis was performed with WS, Grade, Pattern, and their interactions as the fixed factors and Participant as the random factor. The analysis revealed a significant effect of Pattern, $\chi 2$ =2459.7, p < .001 (see Table 7A parameters of models testing the use of verbs by pattern). Post-hoc analyses with Tukey corrections revealed that fa'al was used more frequently than any other pattern (p<.001). In addition, a significant Patterns*Grade interaction emerged, $\chi 2$ =19.98, p = .02 (See Table 8A: Post-hoc analyses with Tukey corrections Patterns*Grade interaction, in the Appendix).

Discussion

The present study examines digital narratives written by native Arabic-speaking adolescents in grades 7, 9, and 11 who used their preferred writing systems for digital media (Arabic, Arabic transcribed into Roman script, or Hebrew script). This study examines both the macrostructure and microstructure of narratives and analyzes the variations in the story written

between different grade levels as well as the influence of different writing systems on verb patterns.

The answer to the first question about how the writing system affects the macrostructure of the narrative for students at different grade levels, is that the writing systems differed at the macrostructure level. Specifically, the highest number of macro-elements produced was found among Hebrew script users and the lowest among Arabic script users. In other words, Hebrew script users produced more than five elements, while Arabic users produced four of the seven elements. The gender effect was insignificant for all macro-elements. However, girls were more likely to choose the Arabic script, while boys were more likely to choose the Hebrew script. This can be attributed to social factors. Boys go out/work in Jewish cities, they also present themselves as young men who are independent, travel alone with friends and can communicate in Hebrew. However, girls generally read more Arabic novels and use Arabic more often at home and in the city. Likewise, no age difference could be determined. This finding of the advantage of the Hebrew writing system over the Arabic writing system in macrostructure can be attributed to two fundamental factors. First, the nature of diglossia in Arabic is widely believed to have a negative impact on the acquisition of basic language skills (Ibrahim et al., 2007). Students learn to extract knowledge and express themselves in their usual written form, which is different from spoken. The second factor is the specific orthographic complexity of Arabic (Asaad & Eviatar, 2013; Ibrahim et al., 2002; Saiegh-Haddad & Schiff, 2016). Arabic orthography presents a challenge to reading and language skills compared to Hebrew (Al Ghanem & Kearns, 2015). The preference for Hebrew script may reflect not only linguistic familiarity but also a pragmatic adaptation to digital writing norms. Khalil (2022) observes that Arabic speakers often shift to hybrid or colloquial registers online to reduce orthographic and syntactic complexity, a strategy likely unavailable to students constrained by formal Arabic in academic settings.

In addition, we assume that typing in the Arabic writing system places significant cognitive demands on students. Therefore, when typing in Arabic, students are aware of the importance of creating StA instead of SpA and switching between the two forms. We suggest that students must inhibit SpA forms in order to correctly use the StA lexical forms. In addition, students must demonstrate cognitive flexibility and be able to switch between SpA and StA. Therefore, this process can affect the macrostructure in the Arabic writing system, while when using the Hebrew script, they are aware that it is acceptable to only use SpA forms that they have mastered. Accordingly, the co-occurrence of diglossia and specific Arabic orthographic complexity makes it

difficult for Arabic learners to compose narratives in a language such as Arabic and prefer to compose high-quality narratives in less complex languages such as Hebrew. These findings support the present study's interpretation that Arabic script use in digital narratives may impose higher cognitive demands than Hebrew, particularly in spontaneous written expression. (Akbar 2019; Sullivan 2017)

Makaruk (2016) provides valuable insight in this regard, arguing that contemporary digital communication increasingly relies on multimodal strategies that blend verbal and non-verbal elements—such as symbols, visuals, and alternative scripts—to optimize meaning and efficiency. Her concept of "multimodal literacy" reflects the evolving communicative repertoire of digital users, who actively select semiotic resources based on context, cognitive ease, and communicative intent. In this light, our participants' script preferences can be viewed not merely as linguistic choices, but as multimodal strategies shaped by both cognitive constraints and the affordances of digital platforms. These findings align with a growing body of research emphasizing the interplay between orthographic systems, language ideology, and digital fluency in multilingual youth populations.

In answering the second question of our study, we addressed the complicated relationship between macrostructure values and verb usage in different WS. Our investigation revealed a crucial discovery: there is a strong positive correlation between macrostructure values and the diversity of root types used in the Arabic writing system. This finding highlights the fact that in the context of Arabic writing, a wider range of root types is directly associated with improved macrostructural performance. In contrast, such a correlation was not shown to be significant in other writing systems, particularly Hebrew and English, suggesting that root type diversity does not have a comparable influence on the macrostructure of these languages. This differential influence highlights the unique position of the Arabic writing system in terms of macrostructural performance. Our analysis assumes that the cognitive demands of using a non-native writing system, different from that deeply embedded in the learner's cognitive framework from an early age (in this case Arabic), limit the author's capacity for linguistic creativity and diversity can affect verb use. The inherent familiarity and fluency of the Arabic writing system, acquired at an early age, appears to give writers the cognitive latitude to experiment with a richer range of verb roots, thereby enriching the macrostructure of their narratives.

Furthermore, this association between a diverse use of root types and improved macrostructural performance in Arabic is consistent with findings from previous studies, particularly those of Tallas-Mahajna & Abu Elhija

(2022); and strengthens the argument for the special linguistic features of Arabic and their Consequences Effects on written expression. This aspect of our study sheds light on the nuanced interplay between Arabic linguistic features and their influence on narrative macrostructure and provides valuable insights into the complexity of multilingual contexts in digital media analysis.

Regarding the third question, how are tenses, verb patterns, and semantic aspects of verbs related to the system at different grade levels?

Verb Tense

The study focused on the relationship between verb tense use and writing systems at different grade levels. The predominant use of the past tense across writing systems indicates a general preference in narrative writing due to its ability to present events chronologically, a common narrative style in educational settings. This makes it easier for students to construct stories or describe past experiences. However, the present tense is occasionally used, particularly in higher grades, for specific narrative purposes or teaching contexts, such as creating immediacy, establishing a direct connection with the reader, or describing ongoing actions or general truths (Park et al., 2011).

The variation in tense use reflects different narrative strategies and linguistic choices in various educational contexts and writing systems. This finding aligns with Fludernik (2003), who argues that tense use in narratives is complex and often influenced by generic reasons rather than simply reflecting historical events. The narrative past tense typically foregrounds the fictionality of a text, creating a distancing effect and locating events in an unspecified past, distinct from the deictic past of historiographical texts. Conversely, the narrative present tense can convey fictionality more strongly by deviating from expected temporal conventions. It is used deictically to allude to the present moment, sporadically to highlight important points, or consistently throughout long passages to emphasize psychological depth, mark climaxes, or indicate changes in perspective. This manipulation of tense enhances the experiential and psychological depth of the narrative, contributing to its atmospheric and visual qualities and bringing the characters' psyches to the forefront, potentially transforming the narrative into a dream-like sequence.

Verb Semantic Features

All participants used eventive verbs more frequently than stative verbs, regardless of age. The significant finding indicating that students across all grades and regardless of writing system (WS) prefer to use eventive rather than

stative verbs is academically interesting. This trend may be influenced by the nature of narrative and descriptive writing tasks in educational institutions, which often emphasize actions, events, and processes. Eventive verbs are inherently more dynamic and can make narratives more exciting and livelier. Students in this age group are more likely to use active verbs that describe actions than stative verbs that describe states or conditions. This tendency is attributed to students' cognitive developmental stage in which action-oriented verbs are acquired earlier and appear more frequently in the stimuli provided (Ari, 2014; Tallas-Mahajna at el. 2023). The lack of significant interaction effects suggests that this trend is consistent across different linguistic and educational contexts.

Transitive verbs, which require an object to express a complete action, are fundamental to constructing clear and coherent narratives. The consistency of their use across different WSs and grades implies a universal aspect of language development and narrative construction in educational settings. Transitive verbs were used more frequently than intransitive verbs across all WSs and grade levels, with an overall significant effect of transitivity observed. This finding suggests a general narrative preference for verbs denoting actions involving direct objects, perhaps because such verbs can convey more specific information about interactions and relationships within the narrative context. The lack of significant WS or WS*transitivity interactions suggests that this preference is a general feature of narrative construction and is not influenced by the specific linguistic or syntactic features of a particular WS.

The preference for transitive verbs across writing systems observed in our study reflects a universal narrative strategy that emphasizes actions with direct objects for clearer communication. This is consistent with study on the structure of verb arguments, which suggests that both grammaticality judgments and production preparation methods point to a fundamental role of transitive verbs in language use and acquisition. This broader applicability of transitive verbs, independent of linguistic or syntactic features, highlights their importance in narrative construction and supports the idea that transitivity improves narrative clarity and specificity in different linguistic contexts (Bidgood et al., 2021).

The results indicate a significant interaction between semantic features and WS. Students used more reflexive and reciprocal verbs in English WS than in Arabic. We suggest that when writing Arabic in English script, the student may lose or change certain semantic features and nuances of Arabic. Dewaele's studies (2004, 2006, and 2008) examined bilinguals' use of emotional words and expressions in multiple languages. The study focused on participants' preferred language for expressing emotions such as anger and swearing, as well

as the perceived emotional intensity of phrases in different languages. Participants tended to experience greater emotional intensity with highly emotional phrases in their native language. Multilingual people preferred their native language for swearing and expressing emotions such as anger. Furthermore, study on code-switching, such as the work of Bond and Lai (1986), suggests that discussing sensitive topics may be easier in a second language, suggesting a coping mechanism and distancing function in such situations. Because students in this study were asked to write about a conflict they faced, the stories were full of emotions and feelings. Therefore, we tend to think that writing a word or a taboo word in Arabic with a different writing system (script change or writing system change as suggested by Abu Elhija (2019)) weakens the emotional impact of its meaning on the reader.

Verb Pattern

The dominance of the Fa'al pattern across all WSs and classes, with significant differences in usage compared to other patterns, highlights its fundamental role in verb formation and usage in these linguistic contexts. The significant interaction between pattern and grade suggests that students' use of specific verb patterns may evolve across grade levels, although fa'al remains a constant. From a developmental perspective, the diverse use of verb patterns other than “fa'al” at different grade levels may reflect students' growing linguistic repertoires and cognitive development. As students age and increase in cognitive ability, they become better at understanding and applying verb patterns with greater morphological complexity (Tallas-Mahajna et al. 2023; 2025). This pattern of mastering simpler and more commonly used structures is typical of language development. Students gradually begin to experiment with and apply more complex patterns as they become more comfortable with the language and aware of its intricacies. Their growing language and educational environment as well as their cognitive maturation all influence this development.

Conclusion

This study delves into the complexities of narrative production among Arabic-speaking adolescents in a multilingual context, examining the interplay between writing systems, macrostructure, and verb patterns. It reveals that the choice of writing system significantly affects narrative macrostructure, with Hebrew script users demonstrating superior performance. This may be

attributed to the cognitive demands and linguistic challenges presented by the Arabic orthographic system and the diglossic nature of Arabic language use.

The study also highlights a positive correlation between the diversity of root types in Arabic writing and macrostructure performance, suggesting that the Arabic script facilitates a richer linguistic expression in narratives. This relationship underscores the unique challenges and opportunities that the Arabic writing system presents in narrative construction.

One of the most pressing pedagogical needs is to scaffold narrative skills with an explicit focus on macrostructural elements and verb usage. The study found that students across writing systems often omitted complex components of story grammar, such as goals and endings, which are vital for narrative coherence. This suggests that while students can recount events, they may struggle to construct fully developed story arcs. Educators should incorporate strategies like story planning templates, narrative frameworks, and guided writing exercises that explicitly model and reinforce the use of all key macrostructural elements. Moreover, emphasizing the use of diverse and contextually appropriate verb patterns can enhance narrative depth and cohesion. By teaching students how to select and manipulate verbs according to narrative function—such as using eventive verbs to drive action or reflexive forms to express internal conflict—educators can help learners produce richer, more nuanced texts.

Equally important is the need to address the cognitive and orthographic challenges associated with the Arabic script. The study highlights that Arabic's diglossic nature, along with the complexity of its script, imposes considerable demands on students' cognitive resources during writing. In this context, students must not only manage intricate orthographic rules but also shift between spoken and standard varieties of Arabic. This dual processing burden can negatively impact their ability to construct coherent narratives. To mitigate these challenges, educators should provide explicit instruction on the functional use of both Spoken Arabic (SpA) and Standard Arabic (StA), as well as opportunities to practice transitions between them. Encouraging students to first draft narratives in SpA and then translate them into StA could foster both fluency and metalinguistic awareness. Additionally, introducing tools such as spelling checkers, visual verb conjugation aids, and phoneme-to-grapheme mapping charts may reduce the orthographic load and support students' written expression.

A related instructional priority is to cultivate morphological awareness and root diversity in verb usage. The study found that greater diversity of verb roots correlated with stronger macrostructural narrative performance—especially when students wrote in Arabic script. This finding speaks to the

unique value of Arabic's root-based morphology as a tool for semantic expansion and narrative enrichment. Educators should prioritize verb morphology instruction, not simply as a memorization task, but as a creative resource for meaning-making. Activities that challenge students to generate multiple verb forms from a single root and incorporate them into a story, or collaborative games that involve matching roots to narrative contexts, can stimulate both morphological agility and narrative sophistication.

Finally, the emotional and psychological dimensions of language choice must be considered, particularly in sensitive narrative contexts. The study found that students were more likely to use reflexive and reciprocal verbs in Latinized Arabic than in Arabic script, possibly due to the reduced emotional salience of non-native scripts. This suggests that script choice can serve as a distancing mechanism, enabling students to discuss emotionally charged or taboo topics more comfortably. Educators should recognize the affective role of script selection and create classroom environments that support emotional storytelling across scripts. This might include allowing students to choose their preferred script for personal narratives, especially in early drafts, and using such moments as opportunities to discuss how language and emotion interact.

In conclusion, the findings underscore the need for nuanced, flexible, and culturally responsive approaches to teaching narrative writing in multilingual, diglossic settings. By scaffolding narrative structure, addressing orthographic complexity, embracing digital literacy practices, promoting verb diversity, and acknowledging the emotional dimensions of script use, educators can empower students to express themselves more fully and effectively across a range of linguistic domains.

Disclosure Statement

The authors reported no potential conflict of interests.

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Appendix

Table 1A

Parameters of models testing macrostructure performance by SG elements

	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
SG	541.54	575.86	-262.77	525.54	130.69	6	**<.001**
WS	525.26	568.15	-252.63	505.26	20.285	2	**<.001**
SG*WS	522.43	616.8	-239.21	478.43	26.831	12	**.008**
Grade	522.58	621.24	-238.29	476.58	1.8497	1	.174
SG*Grade	508.59	632.99	-225.29	450.59	27.839	7	**<.001**
WS*Grade	510.46	643.44	-224.23	448.46	2.1286	2	.345
SG*WS*Grade	524.79	709.25	-219.4	438.79	11.816	14	.62

Table 2A
Pearson Correlation Between Frequencies of Verbal Tokens and Types and the Total Macrostructure Score

English

	Macro	*Spoken*	*Standard*	*RootsTokens*	*RootsTypes*
Macro		.40	.22	.39	.42
Spoken			.55*	.97***	.91***
Standard				.72**	.79***
RootsTokens					.97***
RootsTypes					

Arabic

	Macro	*Spoken*	*Standard*	*RootsTokens*	*RootsTypes*
Macro		.19	.11	.23	.41
Spoken			-.08	.77***	.68***
Standard				.57**	.62**
RootsTokens					.96***
RootsTypes					

Hebrew

	Macro	*Spoken*	*Standard*	*Roots Tokens*	*Roots Types*
Macro		.18	-.18	.04	.19
Spoken Arabic			-.07	.79***	.83***
Standard Arabic				.56***	.44**
RootsTokens					.96***
RootsTypes					

Table 3A
Parameters of Models Testing the Use of Verbs by Tenses

	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
Tense	875.48	889.19	-433.74	867.48	832.81	2.00	**<.001**
WS	877.63	898.21	-432.82	865.63	1.84	2.00	.40
Tense*WS	874.18	908.47	-427.09	854.18	13.30	6.00	**.04**
Grade	875.93	913.65	-426.96	853.93	.25	1.00	.61
Tense*Grade	877.61	922.19	-425.80	851.61	2.57	3.00	.46

Table 4A
Parameters of Models Testing the Use of Verbs by Transitivity

	AIC	BIC	logLik	deviance	Chisq	Df	P
Transitivity	725.22	734.33	-359.61	719.22	72.83	1.00	**<.001**
WS	726.46	741.65	-358.23	716.46	2.75	2.00	.25
Transitivity*WS	728.78	750.04	-357.39	714.78	4.44	4.00	.35
Grade	726.93	739.08	-359.47	718.93	.29	1.00	.59
Transitivity*Grade	727.65	742.83	-358.82	717.65	1.57	2.00	.45
Transitivity*WS*Grade	735.52	775.00	-354.76	709.52	9.70	10.00	.46

Table 5A
Parameters of Models Testing the Use of Verbs by Semantic Features

	AIC	BIC	logLik	deviance	Chisq	Df	P
Sematics	1165.2	1183.90	-577.62	1155.20	387.09	3.00	**<.001**
WS	1166	1192.10	-575.98	1152.00	3.28	2.00	.19
Semantics*WS	1159.7	1208.20	-566.83	1133.70	21.58	8.00	**.01**
Grade	1161.6	1213.80	-566.81	1133.60	.04	1.00	.83
Semantics*Grade	1144.3	1207.70	-555.15	1110.30	23.37	4.00	**<.001**
Semantics*WS*Grade	1152.8	1246.10	-551.42	1102.80	7.45	8.00	.49

Table 6A

Means and Standard Deviation of Verb Frequencies and Percentages of Inchoative, Causative, Reflexive, and Reciprocal

	Arabic N=23								English N=16						
	Inchoative		**Causativity**		**Reflexivity**		**Reciprocity**		**Inchoative**		**Causativity**		**Reflexivity**		**Reciprocity**
Grade	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*
7	3.45 (2.58)	32	1.45 (0.82)	15	4.82 (2.09)	50	0.27 (0.47)	3	3.33 (2.54)	28	1.44 (0.88)	11	7.11 (7.17)	49	1.67 (2.82)
9	4.00 (1.63)	44	2.00 (0.82)	25	3.25 (2.36)	28	0.25 (0.50)	3	6.17 (2.40)	47	1.67 (0.52)	14	4.33 (1.97)	33	0.67 (0.82)
11	6.00 (2.31)	54	2.14 (1.21)	18	3.43 (2.70)	24	0.29 (0.49)	4	3	50	1	17	2	33	0

Table 7A
Parameters of Models Testing the Use of Verbs by Pattern

	AIC	BIC	logLik	deviance	Chisq	Df	p
Patterns	1372.3	1423.4	-675.17	1350.3	2459.7	9	**<.001**
WS	1374.9	1435.3	-674.46	1348.9	1.4055	2	.49
Patterns*WS	1397.4	1541.4	-667.68	1335.4	14.965	20	.77
Grade	1373.9	1429.7	-674.97	1349.9	.3978	1	.52
Patterns*Grade	1372.0	1469.5	-664.97	1330.0	19.983	9	**.02**
Patterns*WS*Grade	1437.1	1859.9	-627.54	1255.1	62.12	60	.40

Table 8A
*Post-hoc Analyses with Tukey Corrections Patterns*Grade Interaction*

Grade 7

contrast	estimate	SE	df	z.ratio	p.value
fa''al - af'al	1.608830	0.444	Inf	3.620	0.0110
fa'al - af'al	3.904046	0.410	Inf	9.529	<.0001
fa'al - fa''al	2.295216	0.190	Inf	12.058	<.0001
fa'lal - af'al	-0.692653	0.702	Inf	-0.986	0.9931
fa'lal - fa''al	-2.301483	0.601	Inf	-3.827	0.0051
fa'lal - fa'al	-4.596698	0.576	Inf	-7.976	<.0001
fa:'al - af'al	1.251666	0.460	Inf	2.721	0.1650
fa:'al - fa''al	-0.357164	0.283	Inf	-1.263	0.9617
fa:'al - fa'al	-2.652380	0.224	Inf	-11.819	<.0001
fa:'al - fa'lal	1.944319	0.613	Inf	3.171	0.0489
ifta'al - af'al	-0.185358	0.602	Inf	-0.308	1.0000
ifta'al - fa''al	-1.794188	0.481	Inf	-3.734	0.0072
ifta'al - fa'al	-4.089404	0.449	Inf	-9.114	<.0001
ifta'al - fa'lal	0.507294	0.726	Inf	0.699	0.9995
ifta'al - fa:'al	-1.437024	0.495	Inf	-2.903	0.1046
infa'al - af'al	-1.101709	0.812	Inf	-1.357	0.9401
infa'al - fa''al	-2.710539	0.727	Inf	-3.731	0.0073
infa'al - fa'al	-5.005755	0.706	Inf	-7.091	<.0001
infa'al - fa'lal	-0.409056	0.908	Inf	-0.451	1.0000
infa'al - fa:'al	-2.353375	0.736	Inf	-3.197	0.0452
infa'al - ifta'al	-0.916351	0.832	Inf	-1.101	0.9848
istaf'al - af'al	-0.407679	0.642	Inf	-0.635	0.9998
istaf'al - fa''al	-2.016509	0.529	Inf	-3.810	0.0054
istaf'al - fa'al	-4.311725	0.501	Inf	-8.613	<.0001
istaf'al - fa'lal	0.284974	0.759	Inf	0.375	1.0000
istaf'al - fa:'al	-1.659345	0.543	Inf	-3.059	0.0681
istaf'al - ifta'al	-0.222321	0.667	Inf	-0.333	1.0000
istaf'al - infa'al	0.694030	0.862	Inf	0.806	0.9985
tfa''al - af'al	-0.003370	0.574	Inf	-0.006	1.0000
tfa''al - fa''al	-1.612200	0.445	Inf	-3.624	0.0109
tfa''al - fa'al	-3.907416	0.410	Inf	-9.523	<.0001
tfa''al - fa'lal	0.689283	0.703	Inf	0.981	0.9934
tfa''al - fa:'al	-1.255036	0.461	Inf	-2.725	0.1634
tfa''al - ifta'al	0.181988	0.603	Inf	0.302	1.0000
tfa''al - infa'al	1.098339	0.812	Inf	1.352	0.9413
tfa''al - istaf'al	0.404309	0.642	Inf	0.630	0.9998
tfa:'al - af'al	1.040132	0.472	Inf	2.204	0.4538
tfa:'al - fa''al	-0.568698	0.302	Inf	-1.885	0.6796
tfa:'al - fa'al	-2.863914	0.248	Inf	-11.554	<.0001
tfa:'al - fa'lal	1.732784	0.622	Inf	2.786	0.1412
tfa:'al - fa:'al	-0.211534	0.324	Inf	-0.652	0.9997
tfa:'al - ifta'al	1.225490	0.506	Inf	2.421	0.3127
tfa:'al - infa'al	2.141841	0.744	Inf	2.880	0.1111
tfa:'al - istaf'al	1.447810	0.553	Inf	2.620	0.2081
tfa:'al - tfa''al	1.043502	0.472	Inf	2.209	0.4504

Grade 9

```
Grade = 9:
 contrast            estimate    SE  df z.ratio p.value
 fa''al - af'al      2.495003 0.735 Inf   3.395  0.0240
 fa'al - af'al       4.639911 0.710 Inf   6.536  <.0001
 fa'al - fa''al      2.144908 0.214 Inf  10.004  <.0001
 fa'lal - af'al     -0.683949 1.220 Inf  -0.561  0.9999
 fa'lal - fa''al    -3.178952 1.015 Inf  -3.132  0.0549
 fa'lal - fa'al     -5.323860 0.997 Inf  -5.341  <.0001
 fa:'al - af'al      2.535642 0.734 Inf   3.455  0.0196
 fa:'al - fa''al     0.040639 0.284 Inf   0.143  1.0000
 fa:'al - fa'al     -2.104269 0.211 Inf  -9.994  <.0001
 fa:'al - fa'lal     3.219591 1.014 Inf   3.175  0.0483
 ifta'al - af'al     0.704825 0.864 Inf   0.816  0.9984
 ifta'al - fa''al   -1.790178 0.536 Inf  -3.338  0.0290
 ifta'al - fa'al    -3.935086 0.501 Inf  -7.849  <.0001
 ifta'al - fa'lal    1.388774 1.111 Inf   1.250  0.9642
 ifta'al - fa:'al   -1.830817 0.535 Inf  -3.423  0.0219
 infa'al - af'al     0.012141 0.996 Inf   0.012  1.0000
 infa'al - fa''al   -2.482863 0.731 Inf  -3.398  0.0238
 infa'al - fa'al    -4.627771 0.705 Inf  -6.560  <.0001
 infa'al - fa'lal    0.696089 1.217 Inf   0.572  0.9999
 infa'al - fa:'al   -2.523501 0.730 Inf  -3.459  0.0194
 infa'al - ifta'al  -0.692684 0.860 Inf  -0.806  0.9985
 istaf'al - af'al   -0.678604 1.218 Inf  -0.557  0.9999
 istaf'al - fa''al  -3.173607 1.012 Inf  -3.135  0.0544
 istaf'al - fa'al   -5.318515 0.994 Inf  -5.350  <.0001
 istaf'al - fa'lal   0.005345 1.404 Inf   0.004  1.0000
 istaf'al - fa:'al  -3.214246 1.011 Inf  -3.178  0.0479
 istaf'al - ifta'al -1.383429 1.109 Inf  -1.247  0.9646
 istaf'al - infa'al -0.690744 1.215 Inf  -0.569  0.9999
 tfa''al - af'al     0.703458 0.864 Inf   0.815  0.9984
 tfa''al - fa''al   -1.791546 0.537 Inf  -3.338  0.0289
 tfa''al - fa'al    -3.936453 0.502 Inf  -7.847  <.0001
 tfa''al - fa'lal    1.387406 1.112 Inf   1.248  0.9645
 tfa''al - fa:'al   -1.832184 0.535 Inf  -3.424  0.0218
 tfa''al - ifta'al  -0.001367 0.702 Inf  -0.002  1.0000
 tfa''al - infa'al   0.691317 0.860 Inf   0.804  0.9985
 tfa''al - istaf'al  1.382061 1.109 Inf   1.246  0.9649
 tfa:'al - af'al     0.415939 0.910 Inf   0.457  1.0000
 tfa:'al - fa''al   -2.079064 0.608 Inf  -3.417  0.0223
 tfa:'al - fa'al    -4.223972 0.578 Inf  -7.310  <.0001
 tfa:'al - fa'lal    1.099888 1.148 Inf   0.958  0.9944
 tfa:'al - fa:'al   -2.119703 0.607 Inf  -3.491  0.0173
 tfa:'al - ifta'al  -0.288886 0.759 Inf  -0.381  1.0000
 tfa:'al - infa'al   0.403799 0.907 Inf   0.445  1.0000
 tfa:'al - istaf'al  1.094543 1.146 Inf   0.955  0.9945
 tfa:'al - tfa''al  -0.287518 0.759 Inf  -0.379  1.0000
```

Grade11

```
Grade = 11:
 contrast             estimate    SE  df z.ratio p.value
 fa''al - af'al       0.698050 0.368 Inf   1.899  0.6700
 fa'al - af'al        3.009843 0.308 Inf   9.781  <.0001
 fa'al - fa''al       2.311793 0.222 Inf  10.406  <.0001
 fa'lal - af'al      -0.600962 0.505 Inf  -1.190  0.9740
 fa'lal - fa''al     -1.299012 0.458 Inf  -2.838  0.1238
 fa'lal - fa'al      -3.610805 0.411 Inf  -8.782  <.0001
 fa:'al - af'al       0.602774 0.374 Inf   1.613  0.8422
 fa:'al - fa''al     -0.095276 0.307 Inf  -0.310  1.0000
 fa:'al - fa'al      -2.407069 0.232 Inf -10.373  <.0001
 fa:'al - fa'lal      1.203736 0.463 Inf   2.602  0.2164
 ifta'al - af'al     -1.005487 0.580 Inf  -1.732  0.7772
 ifta'al - fa''al    -1.703537 0.540 Inf  -3.155  0.0514
 ifta'al - fa'al     -4.015330 0.501 Inf  -8.012  <.0001
 ifta'al - fa'lal    -0.404525 0.641 Inf  -0.631  0.9998
 ifta'al - fa:'al    -1.608261 0.544 Inf  -2.956  0.0908
 infa'al - af'al     -1.699118 0.764 Inf  -2.224  0.4402
 infa'al - fa''al    -2.397168 0.734 Inf  -3.267  0.0364
 infa'al - fa'al     -4.708960 0.706 Inf  -6.672  <.0001
 infa'al - fa'lal    -1.098155 0.811 Inf  -1.354  0.9409
 infa'al - fa:'al    -2.301892 0.737 Inf  -3.124  0.0563
 infa'al - ifta'al   -0.693631 0.860 Inf  -0.806  0.9985
 istaf'al - af'al    -1.292807 0.647 Inf  -1.997  0.6011
 istaf'al - fa''al   -1.990857 0.611 Inf  -3.257  0.0375
 istaf'al - fa'al    -4.302650 0.577 Inf  -7.454  <.0001
 istaf'al - fa'lal   -0.691845 0.702 Inf  -0.985  0.9931
 istaf'al - fa:'al   -1.895581 0.615 Inf  -3.082  0.0636
 istaf'al - ifta'al  -0.287320 0.759 Inf  -0.379  1.0000
 istaf'al - infa'al   0.406311 0.907 Inf   0.448  1.0000
 tfa''al - af'al      0.246556 0.401 Inf   0.615  0.9998
 tfa''al - fa''al    -0.451494 0.340 Inf  -1.329  0.9472
 tfa''al - fa'al     -2.763287 0.274 Inf -10.091  <.0001
 tfa''al - fa'lal     0.847518 0.485 Inf   1.748  0.7679
 tfa''al - fa:'al    -0.356219 0.346 Inf  -1.029  0.9906
 tfa''al - ifta'al    1.252042 0.563 Inf   2.223  0.4407
 tfa''al - infa'al    1.945673 0.751 Inf   2.590  0.2219
 tfa''al - istaf'al   1.539363 0.632 Inf   2.436  0.3042
 tfa:'al - af'al     -1.006144 0.581 Inf  -1.733  0.7768
 tfa:'al - fa''al    -1.704194 0.540 Inf  -3.155  0.0513
 tfa:'al - fa'al     -4.015987 0.501 Inf  -8.011  <.0001
 tfa:'al - fa'lal    -0.405182 0.641 Inf  -0.632  0.9998
 tfa:'al - fa:'al    -1.608918 0.544 Inf  -2.956  0.0907
 tfa:'al - ifta'al   -0.000657 0.703 Inf  -0.001  1.0000
 tfa:'al - infa'al    0.692974 0.860 Inf   0.805  0.9985
 tfa:'al - istaf'al   0.286663 0.759 Inf   0.378  1.0000
 tfa:'al - tfa''al   -1.252700 0.563 Inf  -2.224  0.4403
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A9. Examples of narratives of transcriptive choice in Arabic student (AAF) 9th grade:

"اسمعي ...
اياها اخرفك وحابه شغله معي صارت اليوم
عند رحت اظلمها ومحبيتش البنت متهمه حالي حسيت ليش عارفه مش بس بمستواي مش حكي عني كتبت الجديده الطالبه اليوم
لاني مني بدك وشو وكيف ليش اقولها عندها اروح محبيتش كتبت اللي البنت هاي عنجد انو وشفت الكاميرا وفتحلي المدير
حالي اورط بديش
معها وحكت بالاشي اهتمت وهي صار شو وخرفتها المستشاره عند رحت"

"Listen...
Today something happened to me, and I'd like to tell you about it.
The new girl wrote things about me that were disrespectful, but I didn't know why. I felt like I was accusing her and didn't want to judge her unfairly. I went to the principal and he opened the camera footage. I saw that it really was that girl who wrote it. I didn't want to confront her and ask 'why' and 'what do you want from me,' because I didn't want to get myself into trouble.
I went to the counselor and told her what happened, and she took care of it and spoke to the girl."

A10. Examples of narratives of transcriptive choice in English student (SR) 7th grade:

"Mra bket wana sf 5ames ka3de 7d naden ma 4erha hsa ajt eman bt3rfeha wsart tfsed bena hsa ana bketesh a3ref eno bdo yeje yom nftrek be 3n b3d hsa ba5r yom mn alfsl altane ro7et bde atasaflhen fkrt ene 3njd 4l6ane b7khen wlazm atasaflhen blsodfe laket eman saltha wen mona wnaden? Kaltle b3rfsh koltlha 6yb dro7 adawer 3lehen l7ale ro7et wmalkethenesh komet ro7et 3nd bnat alsf ntfrj 3lsf whome yrkoso wydbko weshe ela mona wnaden dash3at 3ly bkolenle absr sho wb3y6en wheka bkolhen ana sho swet wmalken?! Kamt naden sarat tkole eno ana kolet leman kbl shway ano mona wnaden sbb mot o5then😫😫😫 wna enjnet y3ne sho jab ljab blfsl elthane 7awlt eman eno trj3 also7be zy ma bkt lene anabtha kther 😬bs ana mkbltesh bsohole ene asol7hen leno hene mtakadnesh eda hada al7ke s7 wkman oslobhen msh oslob😅 s7?!🤣 Almohem...,tsol7na w3rfn 4l6hen aked y3ne b3d ma etasafnle"
😂

"Once, I cried when I was in fifth grade, sitting next to Nadeen.
Suddenly, Eman came and started turning us against each other. I didn't cry then, but I knew the day would come when we'd drift apart.
On the last day of the second semester, I went to apologize to her because I thought I was really at fault. I wanted to talk to her. By chance, I found Eman and asked her, 'Where are Mona and Nadeen?' She said she didn't know. I told her, 'Okay, I'll go look for them myself.' I went and didn't find them. Then I went to the other girls in class, and we watched a video of Mona and Nadeen dancing and clapping, and they were making fun of me, saying who knows what. I asked, 'What did I even do?'

Then Nadeen started saying that I told Eman earlier that Mona and Nadeen were the reason their sister died. I was shocked. What does that have to do with anything?!
In the second semester, Eman tried to fix the friendship like she wrote, but I couldn't easily forgive them because I wasn't even sure if what they said was true—and their way of handling it wasn't right.
Anyway… we reconciled in the end, and I realized I had been wrong, especially after she apologized to me."

A11. Examples of narratives of transcriptive choice in Hebrew student (AN) 9th grade:

"לעבנא ולעבנא בעדהא לטאבה וטלענא נלעב לסתאד אעטאנא ראיח עלא דרס אלריאדא מע ספי אגא מרא בקית לחקם אינו לחק עסאחבי מש על ארד וקאל לטאבה מן סאחבי עשאן אגיב גוול למא גית אוכדהא מנו וקע גיית אוכד ומסצו אידיי ומערפתש פיי אגו סחאבי מסצוני ובדרב וילא הוי לאחקני מא שופית עליי ואכדת לטאבה וצמלת ען חאלי וקאם דרבני בזיאדי ומזעלי אואעייה ובקאש פי סתאד ולא מעלם קומת רחת ענד לבואביי וקעדת אדאפע סירי לאהלי שו אואעיק רוחתת עירת אועיי ומגבתש שו סאר קליי רוח עדאר עיר אנאדי קאם אגא לסתאד וכרפתו ומש מאכד ולא אי עקאב ומצייחף סאר מעיי וגיית על מדרסיי לקיית לולד בדחץ"

"Once I was going to PE class with my friend.
The teacher gave us the ball, and we went out to play. After a while, I went to get the ball from my friend to score a goal. When I tried to take it, he fell on the ground and told the referee it was my fault, even though it wasn't.
I got the ball and acted as if I didn't hear him, but he ran after me and hit me. My friends grabbed me and held my hands. I didn't know how to defend myself. He kept hitting me harder, and I got upset and lost consciousness. I didn't tell the teacher. I went to the gate crying and called my father.
The teacher came and asked what happened. I told him everything. He told me to go home and rest. I didn't tell my parents exactly what happened.
The next day at school, I saw the boy laughing and joking around like nothing happened—and no one took any disciplinary action."