The Audio-Visual and Syntactic Priming Effect on Specific Language Impairment and Gender in Modern Standard Arabic(*)

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Abstract

The present study endeavors to investigate if priming is influenced by gender in Modern Standard Arabic and if it is confined solely to subjects with no specific language impairment (SLI), sometimes called Developmental Language Disorder (DLD). The study sample comprises 74 subjects, between the ages of 11;1 and 11;10, distributed into (a) two SLI experimental groups of 38 subjects divided into two gender groups of 18 females and 20 males besides (b) 2 Non-SLI control groups of 36 participants divided into two gender groups of 17 females in addition to 19 males. Using a mixed research design, the researcher conducted this study within the framework of the relevance theory (RT) whose main premise is that human beings are endowed with a biological capability to augment the relevance of the incoming stimuli. Each group was given 2 distinct priming stimuli: audio-visual priming (T1) and syntactic priming (T2). The results manifested that the priming effect was outright distinct among SLI participants especially when recalling typical responses (TR) in T1 and T2 with slight notability of males over females. The results also uncovered that Non-SLI females showed stronger original response (OR) priming in T1

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than males and that non-SLI males in T2 excelled in OR priming than females. Moreover, the results manifested that the audio-visual priming has a sturdier influence on SLI females than Non-SLI females and that syntactic priming seems to have the same impact on the Non-SLI and SLI females. The present study concluded that the priming effect varies according to gender and is not restricted merely to Non-SLI subjects.

Keywords

Specific language impairment, Relevance theory, Audio-visual priming, Modern Standard Arabic

الملخص

تهدف الدراسة الى بحث تأثير الاسترجاع العقلي (ظاهرة لغوية نفسية) على النوع في اللغة العربية المعاصرة، كما تتطرق الدراسة لفحص تأثير الاسترجاع العقلي على عينة من ذوي الاضطرابات اللغوية، تتكون عينة الدراسة من ٧٤ فردًا تتراوح اعمارهم من ١١:١ الي ١١:١٠، وتم تقسيمهم الي مجموعتين تجريبيتين (١٨ إناثًا و٢٠ ذكورًا، من ذوي الاضطرابات اللغوية)، ومجموعتين ضابطتين (١٧ إناثًا و١٩ ذكورًا، ليس لديهم اي اضطربات لغوية). تم استخدام الطريقة الكمية و الكيفية للتعامل مع البيانات، وذلك في اطار نظرية الصلة، و التي تفترض أن الانسان يمتلك قدرة فطرية علي استرجاع المعلومات العقلية وثيقة الصلة، تم اعطاء كل مجموعة نوعين مختلفين من المثيرات، النوع الأول: مثر استرجاعي بصري صوتياً و النوع الثاني: مثير نحوي، والمثيران الأول و الثاني تم اقتباسهما من قصة قصيرة باللغة العربية، وقد اظهرت النتائج ان ظاهرة الاسترجاع العقلي موجودة بين ذوي الاضطرابات اللغوية علي عكس الدراسات السابقة، مع تفوق للذكور عن الإناث. كما أظهرت الدراسة وجود الاسترجاع العقلي بشكل كبير وملحوظ بين من لا يعانون من أي أضطرابات لغوية مع تفوق الاناث علي الذكور.

الكلمات الدالة

ذوي الاضطرابات اللغوية – نظرية الصلة – الاسترجاغ اللغوي البصري السمعي – اللغة العربية المعاصرة

Introduction

Contextually, priming refers to a linguistic phenomenon in which previous exposure to a language item by some means has an impact on posterior language processing, which may take place in the form of perception or production. In other words, priming is an implicit process that occurs in a subliminal way by language users. The implication – based nature of priming makes it one of some semblance of a larger system called implicit memory. Tulving, Schacter, and Stark (1982, p. 336) referred to the implication – based nature of priming when defining priming as "facilitative effects of an encounter with a stimulus on subsequent processing of the same or a related stimulus". Most often, the initial language stimulus, designated as the prime, expedites the perception and production of a subsequent semblance of its meaning, which is commonly referred to as the response or target.

Priming is of three types: auditory, syntactic, and semantic. First, auditory priming means that a language user processes a spoken word more quickly if they have had prior exposure to that word in a previous speech. For example, if a language user listens to a list of words such as *mediocre, embittered, altruistic,* and then is required to listen and repeat words like *plump, luxuriant, altruistic,* the language user will repeat the word that surfaces in the initial list (i.e. *altruistic*) more quickly than the other words that do not appear initially (i.e. *plump, luxuriant*). Second, syntactic priming means that a language user produces a syntactic structure that has already surfaced in a previous discourse. For example, if a speaker uses a double-object dative (e.g. *Wendy bought Bruce a cake*), later on the interlocutor is likely to produce another double-object dative rather than a prepositional dative, such as *Wendy bought a cake for Bruce.* Third, semantic priming means that a speaker tends to process a word more speedily if he/she is previously exposed to a word similar in meaning to the one produced. For example, language users will properly identify the word *tiger* (the target) more speedily if they have recently heard or read the word *lion* (the prime) (Medin, 1997; Ibrahim & Peretz, 2005; Pulvermüller, 2013; Boudelaa, 2014).

This study attempts to explore the correlation between priming and gender among subjects with and without specific language impairment (SLI). Linguists begin to give SLI much attention as it reveals many aspects about the nature of language production, comprehension, acquisition and development. SLI is a kind of language disorder that postpones the mastery of some language skills. SLI children have no hearing loss or other

developmental delays, such as cerebral palsy or autistic spectrum disorders. SLI is sometimes called language delay or dysphasia. Children with SLI are very often as smart as any other child of their age; however, they still have difficulties with language usage, understanding and production. More often than not, there are no clear reasons for these difficulties (Bishop, 2000; Botting & Adams, 2005; Bosco, Parola, Sacco, Zettin, & Angeleri, 2017).

SLI children may, first, have difficulties understanding words, sentences and conversations. That is, they have difficulty with what linguists call receptive language. Secondly, they may experience some trouble in talking using words and sentences (always referred to as expressive language) (Waldie, Wilson, Roberts & Moreau, 2017; Rapin & Allen, 1983). Thirdly, they also may have difficulty using language the right way socially with other children (often called pragmatic language). Finally, they may be unable to utter speech sounds properly, which makes it difficult for others to understand them. SLI children with and without pragmatic language difficulties are the cardinal focus of this research study. Children with SLI, according to Tallal (2000), do not develop the ability to understand and produce proper contextual language. They may have difficulty in all of the previously mentioned areas, or in one more than the others. It means, for instance, that SLI children may be astute, but strive to understand the language used around them. They may have many ideas but find it quite hard to make sentences to express what they are thinking of (Botting & Adams, 2005; Thal & Katich, 1996).

Theoretical framework

Relevance theory (RT), developed by Sperber and Wilson (1995; 2002), is used within the framework of semantics, cognitive linguistics and pragmatics. The main assumption of RT is that human beings are endowed with a biological ability to magnify the relevance of the incoming stimuli. Sperber and Wilson argued that RT is an inference – grounded approach to pragmatics and semantics, based on two principles: cognitive and communicative. Cognitive principle signifies that the human cognition is outfitted to the maximization of relevance; communicative principle means that utterances create anticipation of optimum relevance. The cognitive principle means that we understand the messages with the help of their contexts which provide us with the most likely set of useful ideas. As for the second principle, it means that the ostensive stimulus leads to optimal relevance. In other words, it means when we receive a message, we assume that there are good spin-offs that we can get with less cognitive effort. The basic notions of the RT can be summed up in the following points. First, the

text of the message (i.e. semantic stimulus) interacts with the context to prompt the listeners toward the meaning communicated. Second, if the language users have the same cognitive environment, it facilitates the relevance process and lessens the cognitive effort. Third, an idea is relevant to the language user if it has more positive cognitive effects and is processed with no or less cognitive effort.

Disregarding SLI subjects, many studies (e.g. Bird & Williams, 2002; Bernolet, Hartsuiker, & Pickering, 2007; Kuhl, Stevenson, Corrigan, Bosch, Can & Richards, 2016) have been conducted to explore the priming effect on bilingual speakers within the framework of RT. For example, Bernolet, Hartsuiker, and Pickering (2007) examined the priming effect on 32 Dutch university students who use English as a second language; the sample was given a syntactic prime. The study concluded that syntactic priming only occurred in relative clauses. Like Bernolet, Hartsuiker, and Pickering (2007), Bird and Williams (2002) examined the priming effect on 40 bilingual university students; the sample was given an auditory task. The major result was that priming effect appeared when the language users employed novel words in rhyme. Unlike Bernolet, Hartsuiker, and Pickering (2007), Frenck-Mestre and Prince (1997) examined the priming effect on 108 French university students who employ English as a second language; the stimulus given to the sample took the form of a semantic prime. The study concluded that the priming effect is similar in both the native language and the second language only for proficient learners. Rejecting the results of Frenck-Mestre and Prince (1997), Gries and Wulff (2005) investigated the priming effect on 64 German university students, giving them sentence completion task (i.e. syntactic priming). The basic finding in Gries and Wulff (2005)'s study was that priming effect has been noticed when the participants used double-object and prepositional datives.

Following the steps of Gries and Wulff (2005), McDonough and Mackey (2008) investigated the priming effect on 46 Thai university students who speak English as a second language. The participants were given a syntactic stimulus. This study concluded that the priming effect was noticed when the participants used questions and prepositional datives. Rejecting the results of McDonough and Mackey (2008), Perea, Mallouh and Carreiras (2013) examined the role of visual form vs. abstract representations during the early stages of word processing in third and sixth Non-SLI graders. They investigated the visual priming effect in Arabic as it is marked with its intricate orthography. Results showed that the access to abstract representations was faster than the access to visual ones. These

results were emphasized by Liu and Cao (2016) as well as Tremblay and Dick (2016) who asserted that the classic model of the neurobiology of language is no longer adequate for contemporary investigations and that visual representations are accessed at a slower pace than abstract ones.

This study revisits some neurological and psycho-linguistic concepts concerning priming effect; it refutes the previous belief that the priming effect has no influence on SLI subjects. Further, with careful data probing, this study tries to define the rapport between gender and priming effect among both SLI and Non-SLI subjects.

Research questions

1. Is the priming effect restricted solely to Non-SLI males and females and cannot be noticed among SLI ones in Modern Standard Arabic?
2. Is there any correlation between priming effect and gender in Modern Standard Arabic?
3. Do audio – visual priming in addition to syntactic priming have the same degree of effect on Non-SLI and SLI females and males in Modern Standard Arabic?

Methodology

Participants

A total of 74 students participated in this study (see Table 1). The subjects are divided into 2 major experimental groups: a group with specific language impairment (SLI) and a typically language developing group with no specific language impairment (abbreviated as Non-SLI). The SLI group was divided into two groups: Group1 which comprised 18 SLI females aged between 11;3-11;9 years old; and Group2 which comprised 20 SLI males aged between 11;1-11;7 years old. The Non-SLI group was divided into two control groups: Group 3 and Group 4. Group 3 comprised 17 females with no SLI, aged between 11;4-11;8 years old; and Group4 comprised 19 males with no SLI, aged between 11;1-11;10 years old. Children were diagnosed with SLI on the basis of having no neurological emotional deficits. The first and second SLI groups were selected from two different Speech- Language Clinics in Port Said, an Egyptian coastal city. They have been selected randomly from a large sample of children who have undergone speech tests under the supervision of a speech pathologist; these tests included Renfrew Action Picture Test and The Test of Word Knowledge.

Renfrew Action Picture Test (Renfrew, 2011) was administered to assess the children's spoken capabilities before they were given any tasks. It is a screening test for language development for children between the ages

of 4 and 12 years. Each child was shown 10 colored pictures, and then tester asked the child to describe each picture with a single sentence. The child's utterances are evaluated for the number of events described (i.e. amount of information given) and grammatical structures. Scoring involves calculating an information score and a grammar score for each picture. The Test of Word Knowledge (TOWK) was administered to evaluate children's ability to use and understand vocabulary. This test included expressive vocabulary, word definitions, receptive vocabulary, and word opposites

After taking a permission from the concerned authority, the typically language developing group (i.e. Non-SLI subjects) were selected randomly from fifth graders in Egyptian Nile School, an international educational institution in Port Said, which qualifies children for International General Certificate of Secondary Education (IGCSE). The children were then divided into two Non-SLI groups: 17 females and 19 males (See Table 1).

Table 1: Age and Gender Distribution of the Participants

Groups (G)	Number	Age Range	Average Age	Gender	
				M	F
G1:SLI [F]	18	11;3-11;9	11;5	0	18
G2:SLI [M]	20	11.1-11.7	11;4	20	0
G3:Non-SLI [F]	17	11;4-11;8	11;5	0	17
G4:Non-SLI [M]	19	11;1-11;10	11;5	19	0
Total	74			39	35

Procedure and task design

Each group is given two tasks: audio-visual and syntactic. Task1, the audio-visual prime, has lasted for roughly 21 minutes. Each group was asked to watch a short Arabic story available on YouTube (See Appendix A). The participants were asked to listen and watch the story thrice without writing notes; then they were given a list of 6 sounds; and finally they were asked to write one example word for each of the sounds given. The audio-visual story was relevant and apt to the participants' age and level of education. The story describes the role played by the parents to give care and love to their children. A little boy loved to come and play every day around a huge apple tree. He used to climb to the treetop, eat the apples, and take a nap under the shadow of the tree. The tree in turn loved to play with the boy. Time went by, the boy had grown up and he stopped playing around the tree. The boy only came to the tree when he was in need. When

he needed money, the tree offered her apples to the boy to sell; when he needed a house, the tree offered her branches for the boy to chop off and build the house he needed; and when he needed a boat, the tree offered her trunk. Every time the boy took what he wanted and never showed up for a long time. Ultimately, the boy grew old and went to the tree seeking relaxation and rest. In task2, which has lasted for 20 minutes, the participants in each group were given a list of 6 Arabic words (3 nouns and 3 adjectives) and then asked to insert each word in a sentence. The list of words, given to the participants, was driven from the audio-visual stimulus given to the students in task 1. The scoring system for T1 and T2 was conducted according to table 2 below.

Table 2: Priming-response scoring system

Audio-Visual Task (T1)	Scoring	Syntactic Task(T2)	Scoring
Typical Response (TR) (i.e. The target is identically derived from the prime.)	3	Typical Response (TR) (i.e. The whole sentence is derived from the stimulus given.)	3
Original Response (OR) (i.e. The target is derived far away from the stimulus.)	1	Original Response (OR) (i.e. All the constituents of the sentence do not exist in the prime given.)	1
Semi-Original Response (SOR) (i.e. The target is semantically relevant to a prime with the same sound.)	2	Semi-original response (SOR) (i.e. There is at least a single constituent in the sentence derived from the priming stimulus.)	2

5. Results

SLI male and female participants showed the strongest retrieval of TR in T1 and T2; it was noticeable that TR priming excelled other response types (i.e. OR &SOR). In T1, however, SLI males manifested slight superiority over females with just 3%, but high superiority in T2 with 17% in retrieving TR. Both SLI males and females achieved the least percentages in OR in T1: 9.3% and 7.8%, respectively, but only SLI females achieved the least percentage (i.e. 15.9%) in T2 (See Table 3). In comparison with SLI males, SLI females manifested their priming excellence in SOR in T1 and T2.

Table 3: Responses of female and male SLI participants to audio-visual and syntactic priming

G1[F]	**Audio-Visual Priming (T1)**			**Syntactic Priming (T2)**		
Response Type	Response Occurrences	Response Scoring	Percentage	Response Occurrences	Response Scoring	Percentage
OR	23	23	9.3 %	35	35	15.9%
SOR	32	64	26.1%	٣٥	٧٠	31.9%
TR	53	159	64.6%	٣٨	١١٤	52.2%
Total	108	246	100%	108	219	100%
G2[M]	**Audio-Visual Priming (T1)**			**Syntactic Priming (T2)**		
Response Type	Response Occurrences	Response Scoring	Percentage	Response Occurrences	Response Scoring	Percentage
OR	22	22	7.8%	45	45	17.5%
SOR	35	70	24.9%	16	32	12.7%
TR	63	189	67.3%	59	177	69.8%
Total	120	281	100%	120	254	100%

Table 4: Responses of female and male Non-SLI participants to T1 and T2

G3[F]	**Audio-Visual Priming (T1)**			**Syntactic Priming (T2)**		
Response Type	Response Occurrences	Response Scoring	Percentage	Response Occurrences	Response Scoring	Percentage
OR	61	61	38.4%	37	37	20.7%
SOR	25	50	31.4%	53	106	59.2%
TR	16	48	30.2%	12	36	20.1%
Total	102	159	100%	102	179	100%
G4[M]	**Audio-Visual Priming (T1)**			**Syntactic Priming (T2)**		
Response Type	Response Occurrences	Response Scoring	Percentage	Response Occurrences	Response Scoring	Percentage
OR	22	22	8.7%	61	61	33.7%
SOR	43	86	33.7%	39	78	43.1%
TR	49	147	57.6%	14	42	23.2%
Total	114	255	100%	114	181	100%

Non-SLI females showed stronger OR priming in T١ than males, who, in turn, manifested their priming capabilities in TR retrieval in the same task. As for T2, non-SLI males excelled in OR priming than females whose priming excellence was manifested in SOR retrieval. Non-SLI females achieved weaker TR priming in T2 than males (See Table 4 above). Unlike non-SLI females, SLI males and females in addition to non-SLI males achieved high success in TR priming in T1; however, there are huge priming differences in T2 among the four groups. G1 and G2 surpassed G3 and G4 in TR priming in T1, whereas G3 excelled all other groups in SOR

priming (See tables 3&4 above)

The normality test was conducted for G1: SLI [F] to check the normal distribution of the responses in the two tasks. A Shapiro-Wilk's test (p>.05; T1=32.1% and T2=72.9%) and a visual inspection of their histograms, normal Q-Q plots and box plots showed that the scores were normally distributed for the T1 and T2, with a skewness of T1: 0.360 and T2:0.062 and a kurtosis of T1:0.401 and T2:0.312. The normality test for G2: SLI [M] showed that the scores were normally distributed with T1: p>.05 (28.4%), skewness = 0.102, and Kurtosis =.849. As for T2, the p-value and skewness were 28.3%, and 1.1, respectively. The normality test for G3: non-SLI [F] showed that the scores were normally distributed with T1: p>.05 (11%), skewness = 0.916, and Kurtosis =0.405. As for T2, the p-value, skewness, and kurtosis were 40.8%, 0.121, and 0.855, respectively. The normality test for G4: non-SLI [M] showed that the scores were normally distributed with T1: p>.05 (11.2%), skewness = 0.124, and Kurtosis =1.735. As for T2, the p-value, skewness, and kurtosis were 8.1%, 0.097, and 0.733, respectively.

Table 5: Normality Tests for Experimental and Control Groups

GROUP 1 :SLI [F]	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Audio-Visual Priming	0.150	18	0.200*	0.943	18	0.321
Syntactic Priming	0.133	18	0.200*	0.966	18	0.729
GROUP 2 :SLI [M]	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Audio-Visual Priming	0.178	20	0.095	0.944	20	0.284
Syntactic Priming	0.188	20	.061	0.923	20	0.111
GROUP 3 :Non-SLI [F]	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Audio-Visual Priming	0.243	17	0.109	0.847	17	0.110
Syntactic Priming	0.123	17	0.200*	0.947	17	0.408
GROUP 4 :Non-SLI [M]	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Audio-Visual Priming	.188	19	.077	.866	19	.112
Syntactic Priming	.184	19	.089	.912	19	.081

Levene's Test for Equality of Variances, homogeneity of variance test, is an inferential statistical test that assesses the assumption that the variances of the populations from which different samples are drawn are equal (i.e.H0: $\mu 1 = \mu 2$). The alternative hypothesis states that there're unequal variances among the populations from which the samples are drawn (i.e. HA: $\mu 1 \neq \mu 2$). In table (6) below, the p-value in T1 and T2 in the two groups (G1 and G3) are 82.4% and 98.6% , respectively (i.e., $p > .05$). It indicates the equality of the variances among the populations from which the samples are drawn. In other words, the null hypothesis is accepted and the alternative one is rejected. T-test for Equality of Means is an inferential statistical test that shows whether there is a statistically significant difference between the means in two unpaired groups. This test was conducted to check the statistic differences between the means of G1: SLI [F] and G3: Non-SLI [F]. The null hypothesis (H0) for the independent t-test is that the population means from the two groups are equal (i.e.H0: $\mu 1 = \mu 2$). The alternative hypothesis that the population means are not equal (i.e. HA: $\mu 1 \neq \mu 2$). In table (6) below, the p-value in T1 and T2 in the two groups (G1 and G3) are 0.2% and 10.8% , respectively. It indicates that p-value in T1 is smaller than .05 and that there are statistic significant differences between the means of the two groups. Investigating the means of the two groups indicates that the mean of G1: SLI [F] is bigger than that of G3: Non-SLI [F] with p-value at 0.1% (See table 7). It suggests that audio-visual priming has a stronger effect on G1 than G3. However, p-value in T2 is bigger than .05 (i.e. 10.8%). Therefore, the null-hypothesis is accepted and the alternative one is rejected. It shows that the statistic differences between the means of the two groups are not significant. It indicates that the syntactic priming has the same effect on the two groups.

Table 6: Levene's Test and T-test for Equality of Means (G1 & G3)

(G1& G3)		Levene's Test		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Audio-Visual Priming (T1)	Equal variances assumed	.050	.824	5.374	33	.002	4.31373	.80267	2.68069	5.94676
	Equal variances not assumed			5.371	32.801	.001	4.31373	.80311	2.67940	5.94805
Syntactic Priming (T2)	Equal variances assumed	.000	.986	1.654	33	.108	1.63725	.98993	-.37678	3.65129
	Equal variances not assumed			1.656	32.997	.107	1.63725	.98852	-.37391	3.64842

Table 7: The means of G1: SLI [F] and G3: Non-SLI [F]

Priming type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Audio-Visual Priming	G1:SLI [F]	18	13.6667	2.35147	.55425
	G3:Non-SLI [F]	17	9.3529	2.39638	.58121

Levene's Test for Equality of Variances in table (8) below shows that the p-value in T1 and T2 in G2: SLI [M] and G4: Non-SLI (M) are 17.1% and 14.1%, respectively (i.e., $p > .05$). It suggests the equality of the variances among the populations from which the samples are drawn. In other words, the null hypothesis is accepted and the alternative one is rejected. The t-test for Equality of Means was conducted to check the statistic differences between the means of G2: SLI [M] and G4: Non-SLI [M]. The null

hypothesis (H0) for the independent t-test is that the population means from the two groups are equal (i.e.H0: $\mu 1 = \mu 2$). The alternative hypothesis that the population means are not equal (i.e. HA: $\mu 1 \neq \mu 2$). In table (8) below, the p-value in T1 and T2 in the two groups (i.e.G2 and G4) are 23.7 % and 0.4%, respectively. It shows that p-value in T1 is bigger than .05 and that there are no statistic significant differences between the means of the two groups. It indicates that the audio-visual priming has the same effect on the two groups. However, p-value in T2 is smaller than .05 (i.e. 0.4%). Therefore, the null-hypothesis is rejected and the alternative one is accepted. It suggests that the statistic differences between the means of the two groups are significant. Investigating the means of the two groups indicates that the mean of G2: SLI [M] is bigger than that of G4: Non-SLI [M] with p-value at 0.2% (See table 9). It indicates that syntactic priming has a stronger effect on G2than G4.

Table 8: Levene's Test and T-test for Equality of Means (G2 & G4)

(G2& G4)		Levene's Test		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-taile)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Audio-Visual Priming	Equal variances assumed	7.700	.171	.203	37	.237	1.20789	1.00410	-.82661	3.24240
	Equal variances no assumed			.186	27.790	.246	1.20789	1.01823	-.87856	3.29435
Syntactic Priming	Equal variances assumed	.263	.141	.251	37	.004	3.17368	.74657	1.66099	4.68637
	Equal variances not assumed			4.219	33.227	.001	3.17368	.75222	1.64367	4.70370

Table 9: The means of G1: SLI [F] and G3: Non-SLI [F] in T2

	Group	N	Mean	Std. Deviation	Std. Error Mean
Syntactic Priming	G2:SLI[M]	20	12.7000	1.97617	.44189
	G4:Non-SLI[M]	19	9.5263	2.65348	.60875

In table (10) below, Levene's Test for Equality of Variances shows that the p-value in T1 and T2 in the two groups (G3 and G4) are 10.2% and 84.8 %, respectively (i.e., $p > .05$). It indicates the equality of the variances among the populations from which the samples are drawn. Namely, H0 is accepted and HA is rejected. Furthermore, in table (10) below, t-test for Equality of Means was conducted to check the statistic differences between the means of G3: Non-SLI [F] and G4: Non-SLI [M]. The null hypothesis is H0: $\mu 1 = \mu 2$, whereas the alternative hypothesis is HA: $\mu 1 \neq \mu 2$. The p-values in T1 and T2 in the two groups are 0.3 % and 28.4%, respectively. It indicates that p-value in T2 is smaller than .05. Therefore, the null-hypothesis is rejected and the alternative one is accepted. It shows that the statistic differences between the means of the two groups are significant. It points out that there are gender differences when responding to audio-visual stimulus. Investigating the means of the two groups in T1 indicates that the mean of G4: Non-SLI [M] is bigger than that of G3: Non-SLI [F] with p-value at 0.1.5% (See table 11). It suggests that males have stronger audio-visual priming than females. However, in T2 the p-value is bigger than .05 and that there are no statistic significant differences between the means of the two groups. It indicates that there are no gender differences when responding to syntactic priming.

Table 10: Levene's Test and T-test for Equality of Means (G3 & G4)

(G3 & G4)		Levene's Test		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Audio-Visual Priming	Equal variances assumed	11.804	.102	-3.184	34	.003	-3.48916	1.09596	-5.71642	-1.26191
	Equal variances not assumed			-3.267	30.301	.003	-3.48916	1.06795	-5.66930	-1.30903
Syntactic Priming	Equal variances assumed	.037	.848	1.093	34	.284	1.00310	.91781	-.86212	2.86831
	Equal variances not assumed			1.088	32.856	.282	1.00310	.92162	-.87226	2.87846

Table 11: The means of G3: Non-SLI [F] and G4: Non-SLI [M] in T1 and T2

Priming Type	Groups	N	Mean	Std. Deviation	Std. Error Mean
Audio-Visual Priming	Non-SLI [F]	17	9.3529	2.39638	.58121
	Non-SLI [M]	19	12.8421	3.90531	.89594
Syntactic Priming	Non-SLI [F]	17	10.5294	2.85302	.69196
	Non-SLI [M]	19	9.5263	2.65348	.60875

Discussion

The present study disagrees with Boudelaa and Wilson (2011)'s "Productivity and priming: Morphemic decomposition in Arabic" which disregarded the priming effect on gender and focused solely on subjects with no SLI. Boudelaa and Wilson (2005; 2011) pointed out that Arabic morphology embraces the interleaving of two morphemes: a root consisting solely of consonants and a word pattern comprising primarily of vowels. The root conveys semantic meaning, whereas the word pattern conveys morpho-syntactic in addition to phonological information. In some masked and cross-modal priming experiments, Boudelaa and Wilson (2011) investigated the processing relevance between these two morphemes (i.e. the root and word pattern) during word recognition by probing the roles played by these two morphemes in producing word pattern priming in Arabic deverbal nouns. They found that priming was determined entirely by the root rather than the word pattern. However, the present study and Boudelaa and Wilson (2011)'s agree that the syntactic effect can be noticed among Non-SLI subjects in Arabic.

Mountaj, Yagoubi, Himmi, Ghazal and Besson (2015) and the present study agree that the semantic effect can be noticed in Arabic. However, the recent studies pointed out that the semantic priming is noticeable among SLI and Non-SLI females and males especially when retrieving SOR, with some SLI female superiority and Non-SLI male superiority over SLI males and Non-SLI females in T1, respectively. As for T2, the semantic priming was totally apparent when retrieving SOR with sweeping SLI and Non-SLI female superiority. Mountaj et al. (2015) used a semantic judgment task with Arabic words in their paper, "Vowelling and semantic priming effects in Arabic", in order to examine the existence of semantic priming effect in Arabic. The Arabic orthographic system is characterized by a shallow and a deep orthography. A shallow orthography refers to the vowelized words, whereas deep orthography refers to the words which are not vowelized. They attempted to examine the relevance between orthographic and semantic processing. Results displayed faster Reaction Times (RTs) for semantically related than unrelated words with no difference between vowelized and non-vowelized words.

The present study agrees with Ibrahim (2009)'s "The cognitive basis of diglossia in Arabic", which gave evidence for the visual priming among Non-SLI speakers of spoken Arabic and literary Arabic. Ibrahim (2009) investigated the cognitive basis of diglossia in Arabic. Auditory and visual effects were compared within both spoken Arabic and literary Arabic (LA). Using lexical decisions, Ibrahim (2009) found a significant priming effect at

lag 0 when the primes were in literary Arabic and relatively long lags within spoken Arabic.

The present study agrees with Perea, Mallouh, Mohammed, Khalifa, and Carreiras (2018)'s "Does visual letter similarity modulate masked form priming in young readers of Arabic", which showed how strong the visual priming on Arab Non-SLI readers. In the present study, the visual priming was clearly detected among SLI females and males in addition to Non-SLI males. Perea et al. (2018), depending on Ibrahim (2009), pointed out that the priming effect in Arabic is of an orthographic (i.e. visual) nature. They carried out a priming lexical decision experiment to investigate whether visual letter similarity has an effect during the initial stages of word processing in young Arabic fifth graders. They created two priming conditions for each target word. These two priming conditions differ in only one letter. The letter from the consonantal root was replaced with another letter that did not keep the same shape. To test the presence of orthographic priming effects, an unrelated priming condition was included. Perea et al. (2018) concluded that there was a considerable orthographic priming effect close to the unrelated condition regardless of visual letter similarity. It revealed that Arabic Non-SLI subjects are able to quickly process the diacritical points of Arabic letters.

Pearson, Fernández, and Oller (1993)'s "Lexical Development in Bilingual Infants and Toddlers" concluded that the visual priming effect can be noticed among Non-SLI Arabic subjects, a result that is in harmony with that of the present study. Pearson et al. (1993)'s study aimed at exploring how bilingual infants organize the lexical information in their two languages. It also sought to reveal any correlation between semantic priming effect and the vocabulary size, using some vocabulary measures such as the BPVS II and the SETK. The basic design was that the subjects were given a prime word (e.g. 'cat') followed by a target word which was semantically related to the prime (e.g. 'dog') or not related at all (e.g. 'taxi'). Immediately the researchers presented two images, one for the target and another for the distracter. The results demonstrated an effect of visual priming in the word-word condition but no visual priming effect was noticed in the word-image condition. The overall result, which is enhanced by Yoncheva, Wise, and Mccandliss (2015), uncovered a significant visual priming effect with a different pattern in both Arabic and English.

The present study agrees with Bates, Devescovi, Hernandez, and Pizzamiglio (1996)'s "Gender priming in Italian", which attempted to set a correlation between gender and priming effect in Italian. Bates et al. (1996) aimed at (1) exploring if the grammatical gender of a noun modifier can

prime recognition of the following noun and (2) investigating if the priming effect comprises facilitation or inhibition. Results revealed an obvious impact of gender priming with both facilitation and inhibition. Like Bates et al. (1996), the present study asserted that there is a strong correlation between gender and priming, for example, Non-SLI females showed stronger OR priming in T1 than males, who manifested their priming capabilities in TR retrieval in the same task. Non-SLI males in T2 excelled in OR priming than females whose priming excellence was apparent in SOR retrieval.

Jescheniak (1999)'s "Gender priming in picture naming: modality and baseline effects" attempted to explore the relationship between gender and audio-visual and syntactic priming effect. Jescheniak argued that *gender priming in language production is attributed to the issue of whether the activation of a noun is facilitated by pre-retrieval of its grammatical gender. Such a gender pre-retrieval has been considered the reason of many word substitution errors in which a substituted word is chosen as it tends to have the same grammatical gender as the target word. Gender priming in* Jescheniak's study *was explored in two primed picture-naming experimental groups with German participants. Some primes were presented visually, while others were presented auditorily and differed in whether they had grammatical gender or not. The conclusion was that gender had a tremendous effect on audio-visual priming in German, which underpins the results in the present study.*

Conclusion

SLI males and females proved that the priming effect is not restricted solely to Non-SLI subjects. The priming effect was sheer distinct among SLI participants especially when retrieving TR in T1 and T2 with slight superiority of males over females. Non-SLI groups proved that priming is affected by gender. Non-SLI females showed stronger OR priming in T1 than males, who, in turn, manifested their priming capabilities in TR retrieval in the same task. As for T2, non-SLI males excelled in OR priming than females whose priming excellence was manifested in SOR retrieval. It is clearly revealed that audio-visual priming and syntactic priming have not the same effect on Non-SLI and SLI females. It is revealed that audio-visual priming has a stronger effect on SLI females than Non-SLI females. However, syntactic priming seems to have the same effect on the two groups (Non-SLI and SLI females). As for SLI and Non-SLI males, the audio – visual priming seems to have the same effect on the two groups, whereas the syntactic priming has a stronger effect on SLI males than Non-SLI ones.

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Appendix A

منذ زمن بعيد ولى، كان هناك شجرة تفاح في غاية الضخامة.. كان هناك طفل صغير يلعب حول هذه الشجرة يوميا، وكان يتسلق أغصان هذه الشجرة، ويأكل من ثمارها.. وبعدها يغفو قليلا لينام في ظلها. كان يحب الشجرة، وكانت الشجرة تحب لعبه معها مر الزمن، وكبر هذا الطفل، وأصبح لا يلعب حول هذه الشجرة بعد ذلك، في يوم من الأيام، رجع هذا الصبي وكان حزينا، فقالت له الشجرة : "تعال والعب معي" ، فأجابها الولد : "لم أعد صغيرا لألعب حولك، أنا أريد بعض اللعب، وأحتاج بعض النقود لشرائها"، فأجابته الشجرة :" أنا لا يوجد معي أية نقود!.. ولكن يمكنك أن تأخذ كل التفاح الذى لدي لتبيعه ثم تحصل على النقود التي تريدها". الولد كان سعيدا للغاية، فتسلق الشجرة، وجمع جميع ثمار التفاح التي عليها ونزل من عليها سعيدا، لم يعد الولد بعدها.. كانت الشجرة في غاية الحزن بعدها، لعدم عودته.

وفي يوم رجع هذا الولد للشجرة، ولكنه لم يعد ولدا بل أصبح رجلا! وكانت الشجرة في منتهى السعادة لعودته وقالت له: "تعال والعب معي" ولكنه أجابها وقال له:"أنا لم أعد طفلا لألعب حولك مرة أخرى، فقد أصبحت رجلا مسئولا عن عائلة، وأحتاج لبيت ليكون لهم مأوى، هل يمكنك مساعدتي بهذا؟" فقالت الشجرة:" آسفة!.. فأنا ليس عندي لك بيت، ولكن يمكنك أن تأخذ جميع أفرعي لتبني بها لك بيتا" فأخذ الرجل كل الأفرع، وغادر الشجرة وهو سعيدا.. وكانت الشجرة سعيدة لسعادته ورؤيته هكذا، ولكنه لم يعد إليها، وأصبحت الشجرة حزينة مرة أخرى. وفي يوم حار جدا، عاد الرجل مرة أخرى، وكانت الشجرة في منتهى السعادة، فقالت له الشجرة : "تعال والعب معي" فقال لها الرجل : "أنا في غاية التعب، وقد بدأت في الكبر، وأريد أن أبحر لأي مكان لأرتاح ، هل يمكنك إعطائي مركبا؟" فأجابته :" يمكنك أخذ جذعي لبناء مركبك، وبعدها يمكنك أن تبحر به أينما تشاء، وتكون سعيدا" فقطع الرجل جذع الشجرة، وصنع مركبه! فسافر مبحرا، ولم يعد لمدة طويلة جدا.

أخيرا عاد الرجل بعد غياب طويل، وسنوات طويلة جدا، ولكن الشجرة أجابت وقالت له: "آسفة يا بني الحبيب، ولكن لم يعد عندي أي شيء لأعطيه لك" وقالت له :" لا يوجد تفاح" قال لها: "لا عليك لم يعد عندي أي أسنان لأقضمها بها". قالت :" لم يعد عندي جذع لتتسلقه، ولم يعد عندي فروع لتجلس عليها" فأجابها الرجل : "لقد أصبحت عجوزا اليوم، ولا أستطيع عمل أي

شيء" فأخبرته :" أنا فعلا لا يوجد لدي ما أعطيه لك ، كل ما لدي الآن هو جذور ميتة" أجابته وهي تبكي فأجابها وقال لها: "كل ما أحتاجه الآن، هو مكان لأستريح به، فأنا متعب بعد كل هذه السنين"

فأجابته وقالت له : "جذور الشجرة العجوز، هي أنسب مكان لك للراحة... تعال، تعال واجلس معي هنا تحت واسترح معي فنزل الرجل إليها، وكانت الشجرة سعيدة به، والدموع تملأ ابتسامتها. هل تعرف من هي هذه الشجرة؟

https://www.youtube.com/watch?v=YWTfZaF-NlU&t=101s