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Acquisition of noun and verb morphology in spoken Arabic among children with typical language development (TLD) and children with developmental Language disorder (DLD)

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1. Introduction

Acquisition of derivational morphology has been studied extensively in many languages including cross-linguistic comparative studies: In English-French (Petrush 2008), English (Clark 2015), Hebrew (Berman 1987), Turkish (Halle and Marantz 1994), German (Clahsen, Sonnenstuhl & Belvins 2002), Italian (Scalise 1980) and Polish (Bozic, Szlachta & Marslen- Wilson 2013). Yet, as of the time this paper is written, there is a very small number of studies on this topic in Arabic, especially comparing verb and noun derivational morphology (e.g., Saiegh – Hadad, Hadieh & Ravid 2012) and (Saiegh-Haddad & Geva 2008), in children with typical language development TLD and children with Developmental Language Disorder DLD.

The current study will focus on production of nouns and verbs among Arabic speakers who are typically developing children TLD and Children with Developmental Language Disorder DLD. Nouns and verbs are the two major categories in the early lexicon (Loeb, Pye & Richardson 1996). During preschool and early elementary age, children possess less diverse verb repertoires, compared with nouns repertoires (Watkins, Rice, & Moltz 1993), Pinker (1989) and Levin (1993), including in Arabic (Saiegh-Hadad &Spolsky 2014). It is often reported that children's first words are primarily nouns (Gentner 1978, Macnamara 1972; Nelson 1973). Nouns are particularly accessible to infants since they are simpler forms. Nouns are also conceptually more basic than the concepts referred to by verbs or prepositions. Alson (1964) claims that the kinds of things denoted by nouns are different and more fundamental than the kinds of things denoted by verbs. The acquisition of verbs, is considered a necessary phase that follows noun acquisition. However, studies suggest that verbs may be a problematic area for children with DLD and to a lesser extent problematic for children with TLD. Children with DLD experience more difficulty with nouns also compared to children with TLD. (Gentner 1978, Macnamara 1972 & Nelson, 1973).

Therefore, Arabic speaking children with DLD are expected to experience difficulties in derivational morphology, and more in verb morphology, like other children who speak other languages, than children with TLD.

This study will examine and compare performance of Arabic speaking children with TLD and Arabic speaking children with DLD in two domains, noun derivation and verb derivation. The study will investigate verbs and nouns formation in Palestinian Arabic (PA), with a focus on high frequency nominal and verbal patterns. Population type of subjects, DLD or TLD, will be the independent variable. Performance on tasks of testing knowledge of derivational morphology will be the dependent variable. The testing material employed will remain constant for both groups.

Performance on tasks testing knowledge of derivational morphology by children as reflected in ability to derive nouns from verbs (deverbal nouns) and verbs from nouns (denominal verbs) will be examined. Finally, the impact of frequency, of derived verbs and nouns in the language, on performance will be also be evaluated.

Literature Review

2.1 Developmental Language Disorder

Developmental Language Disorder DLD is a term coined by (Bishop, Snowling, Thompson, Greenhaigh & The CATALISE Consortium, 2017). The term applies to "children who show significant deficits in language learning ability but produce age-appropriate scores on non-verbal tests of intelligence, normal hearing, and no clear evidence of neurological impairment" (Leonard 1988).

At the age of five years old, the occurrence of DLD might be as high as 7% (Tomblin1996 & Tomblin et al 1997). This percentage might become lower as children get older, since some of the children with milder language difficulties achieve normal levels of ability within a few years, often with the help of external involvement.

Children with DLD usually demonstrate significant language difficulties such as a delay in learning their first words, and they continue to add new words to their lexicons at a slower rate compared to normally developing children TLD. Factors such as hearing impairment, neurological damage, autistic tendencies, low non-verbal IQ, oral structure or motor abnormalities are absent and ruled out as determinant factors for such a delay in their language acquisition.

Ravid, Avivi and Levy (2000) have reported processing problems, in children with DLD. Although their study focused solely on structure and semantics, of Hebrew nouns, they argue that children with DLD "are slow in processing linguistic information; they do not make efficient use of sentence structure and of discourse structure, in identifying the meaning of an unfamiliar word; they take more time in task of lexical retrieval" (p.39). Ravid et al (2000) also stated that children with DLD have a "later onset and slower pace of language development than in children without deficit." (p.39)

2.2 Derivational morphology in Arabic

Morphology is the study of the combination of morphemes to create new words. Seidenberg & Gonnerman (2000) identified derivational morphology as the aspect of the language that relates to the structure and formation of words such as prefixing (e.g., Type-retype), suffixing (e.g., Govern-Government-Governmental), this is not how we view derivation in Arabic and Hebrew. In English, nouns can be formed by adding derivational morphemes to forms to create separate words. The derivational suffix –er, for example turns a verb into a noun, usually meaning the person or thing that performs the action denoted by the verb. Thus {paint} + {-er} creates *painter*, meanings "someone who paints".

English verbs can be formed based on other words either by zero conversion (e.g. *fax*, which is both a noun and a verb denoting ('send a fax') or by affixation (e.g. *generalize*, derived from the adjective *general*) (Laks, 2011).

In Semitic languages like Arabic and Hebrew, morphological derivation involves two bound morphemes. Saiegh-Haddad & Henkin-Roitfarb (2014) state that "Arabic, is characterized by a

mainly "non-linear or non-concatenative morphological structure." At the center of this structure is a "*jaðr* 'root' and a derivational or inflectional pattern *mi:za:n ṣarfiyy*".(p.9).

The first one is a trilateral and sometimes quadrilateral root. The second morpheme is a word pattern or template: 15 different trilateral verbal patters, and two distinct quadrilateral patterns *faʕlal and tafaʕlal.* (See Holes 2004, Broselow 2008 & Larcher 2009).

"The root is an unpronounceable bound morpheme, a skeleton of consonants" (Bentin and Frost 1995, p. 273) which provides the semantic family, or the core meaning. A unique lexical item is produced when inserting the root consonants within the specific word pattern that has a unique meaning and a well-defined grammatical category.

Saiegh-Haddad & Roitfarb (2014) also indicate that the root-pattern morphological structure is common to almost all Arabic content words and some function words, such as *qabl* 'before'. In terms of word pattern, Saiegh-Haddad & Roitfarb (2014) outlined two patterns in Arabic: *verbal patterns* and *nominal patterns*. Verbal patterns combine with roots to derive verbs, whereas nominal patterns combine with roots to derive nouns. Nominal patterns form a very large set in Arabic. For example, Wright's grammar of Classical Arabic lists 44 nominal patterns derived from the first verbal pattern only. However, Holes (2004) have noted that only eleven among these 44 patterns are commonly used in modern Arabic

Arabic language is made more complex, due to lack of uniformity in combining roots to produce completely predicatble patterns (Saiegh – Hadad and Roitfarb 2014). For example, from the verb *jalas* Impf. *yajlis* 'to sit' we find *majlis* 'place or time of a meeting' in the *ma*C1C2*i*C3 pattern for place and time of an action distinct from *majlas.* This lack the uniformity, contribute to morphological ambiguity. Sometimes, it actually becomes quite difficult to extract the meaning of a word from its root-pattern.

Another factor causing the morphological vagueness, in Arabic, is the fact that "Many patterns are the result of a series of derivational steps, some of which are semantically systematic, while others seem arbitrary" (Bateson 2003.P.2). Bateson (2003) illustrates this morphological obscurity by demonstrating how series of derivational steps can be systematic or arbitrary. "So *qawmiyya* 'nationalism' is derived in stages from *qawm* 'race, people, nation' + attributive suffix *-iyy =* > *qawmiyy* 'national' + feminine suffix *-a* for an abstract noun" (ibid, p. 2).

To sum up, in a comprehensive review, Saiegh-Haddad & Roitfarb (2014) outlined the following distinctive features, regarding the morphology of Arabic language, as a Semitic language. The following outline is a summary that shows the most important distinctive features:

A. Non-linear or non-concatenative morphological structure.
B. Morphological derivation usually involves two bound morphemes.
C. The root-pattern morphological structure is common to most Arabic words and some content words.
D. Word patterns in Arabic can be classified as Verbal Patterns and Nominal patterns.
E. Patterns are neither systematic nor predictable, although they may have clear functions.

F. Finally, many patterns are the outcome of a number of derivational steps, some of which are arbitrary. This aspect adds to linguistic difficulty of Arabic Language.

2.3 Derivational morphology in children with TLD

There seems to be a consensus among linguists regarding features of verb and noun acquisition. The process of acquiring verb meanings takes longer than that of noun. This acquisition feature appears to hold cross-linguistically (Gentner 1982). Nouns normally enter the vocabulary before verbs. Even after verbs enter the vocabulary, errors in verb usage continue for a very long time. Bowerman has noted that children make many errors in producing verbs even with frequent and simple ones. (Bowerman 1971 & 1981).

The process of deriving new word forms begins in early childhood, initially as unanalyzed wholes. Children begin making use of derived word forms patterns after age 2 years (Clark 2015). Eve Clark termed the next phase in development as "spontaneous coinage". The mastery of derived word form patterns depends on the child's ability to identify core stems and affixes, what Berman termed as "root extraction." (Berman 1989). She also stated that children could begin extracting at age 3. Berman (1984) linked derivational morphology to literacy and claimed that it continues to develop into school age.

2.3.1 Nouns

Berman et al (1982) examined the acquisition of "Agent" and "instrument noun" forms among 60 children with TLD aged 3, 4, 5, 7, and 11. They outlined three principles that children use to coin agent and instrument noun forms. First, is what they termed as "Semantic Transparency," defined as "known elements with one-on-one matches of meanings to forms are more transparent for constructing and interpreting new words, than elements with one-many or many-one matches" (p.18-19). Second principle, termed as "formal simplicity," stating that it is easier to acquire simple forms than more complex ones. The third has to do with the principal of "productivity," namely those devices more frequently used, by adults, compared with children, are most productive.

Following the same technique as in Clark and Hecht (1982) to elicit innovative nouns, Berman et al., (1982) have posed questions which are designed to elicit either agent or instrument forms (new coinages) and compared between Hebrew and English speaking children. They found that children preferred different word-formation options at different ages.

The limitation among preschool children for eliciting innovative nouns could be connected to the use of partial general rules or scheme. When children coin new words, they rely on low-level mapping (one-to one), whereas eliciting new words requires a higher level of operations (Berman, 2000, 2004; Chmura-Klekotowa, 1971; Clark, 1982, 2000; Dabrowska, 2006). It could be also connected with the level of linguistic awareness in a child which makes the task more complicated and difficult, particularly when the task requires a direct naming ("what would you call x…?"; Berko 1958; Clark & Berman, 1984' Duncan, Casalis &Cole, 2009).

There is a dearth of cross - linguistic research on noun acquisition (nouns derived from roots) among normally developing children and in PA particularly. However, few have been conducted on adjectives acquisition (see Abo-nofal, 2002) for example and nouns acquisition (nouns, which are not derived from a root such as 'korsi, kalam',… (See Farah, 2001).

2.3.2 Verbs

It has been suggested that semantic development has a central role of verb acquisition. Moreover, the semantic structure of the verb contains conceptual roles (e.g., the giver, the thing that is given, and the receiver) .Also, they contribute in important ways to language's grammatical structure. Some linguists claim, that once children understand the meaning of a verb, they will be able to use it. (Gropen, Pinker, Hollander, & Goldberg, 1991: Pinker, 1989).

Berman, (1989) discussed Hebrew speaking children's ability to understand and produce novel verbs in Hebrew, innovated from familiar names and adjectives. Children were able to perform root extraction from the age of three or four. Children, in her study, performed better at "identifying consonantal roots when presented with novel verbs for comprehension than in producing novel verbs by extracting roots." (p.1). Children produced new verbs, in line with the standard morphological patterns used in verb construction in the Hebrew. In terms of Hebrew verb patterns, children aged 3-9 favored particular verb-pattern over denominal verb - formation (a verb formed directly from a noun) although other patterns do exist equally in the established lexicon and in the children's own speech. Furthermore, despite the fact that P1 pa'al (CVCVC) pattern is the most frequent both in the established lexicon and in everyday conversational usage, 3-5 year old children almost did not coin new verbs using it. These findings are important, according to Berman, since they show that children, at a very young age, know what frame a possible verb in their language as well as the most suited verb pattern in Hebrew**.**

There is a dearth of research on verb derivational morphology with TLD children in Arabic. For example, in her study, Tarabani (2006) focused on the structure and semantics of Arabic verbs in acquisition among Arabic speaking children. In her work, she mapped the distribution of roots and verb pattern among 94 Arabic speaking preschool children with TLD aged 3-10 years old. Tarabani found that the number of utterances among children increases with age. In addition, production of more clauses that contained verbs increased with age and the number of verbs per clause increased as well. Furthermore, three types of verb forms were found to occur in the spoken Arabic among children. Two of these are grammatical verbs: separate (e.g, ka:n / 'was' كان) and auxiliary (e.g,badd / 'want'بد). The third is lexical verbs (e.g., libbes /لبس 'wore'). Most verbs were lexical, then auxiliary and last separate verbs. Children's (age 5-6) production for lexical verbs was higher compared to the other groups; however lower for auxiliary verbs compared with 9-10 years old children. In terms of Arabic patterns, *CaCaC* was the most frequent pattern (binyan) among all group ages (age 2-10), followed by the pattern *CaCCaC* and then *itCaCCaC*. All children's groups used the *CaCCaC* (فعلل) pattern (a verb with 4 root consonants; quadrilateral verbs) very infrequently. Verbs tense error

production showed frequency of errors decline with age. Most frequent error type in all age groups was inflection errors.

In terms of Arabic verb patterns, Tarabani's findings are supported by Farah (2004) research and Khori's (2004) work. Both established that the most common pattern among children was *CaCaC* pattern. With age, development and linguistic syntactic complexity and diversity in the various patterns used, grow. Children's production increases as more words with different patterns, are added, allowing more specificity and abstraction.

Laks (2011) in examining denominative verbs formed from existing nouns, found that in choosing a pattern for a new verb, speakers take in consideration several types of factors, both morpho-phonological and syntactic-semantic, and combine them in order to form a new verb that matches to the rules of the language. First, *CaCaC* pattern was uncommon, in both Modern Hebrew and Arabic. Second, is the possibility of semantic influence. Furthermore, Semantic resemblance plays a role in the formation of new verbs

Denominative verbs formed from existing nouns or adjectives in Modern Hebrew and PA. (Laks 2011) (e.g. PA *tmarkaz* 'became central' derived from the PA noun *markaz* 'center'.). The data collection method relied on volunteer native speakers who documented the use of new verbs in their environments. Speakers of other dialects of Arabic, e.g. Lebanese Arabic, provided certain Arabic examples. Other examples were collected from online data of various media sources, including newspapers and brochures and data collected in previous studies of denominative verb formation in Modern Hebrew (Bolozky 1978, 1986, 1999, 2003a, Schwarzwald 1981a, 2000, Bat- El 1994, Berman 1987, Ussishkin 1999a, 2005). The data included 531 instances of verb innovation in Modern Hebrew and 134 instances in PA.

2.4 Derivational morphology in children with DLD

Most of the research in this area, with children with DLD, used English - speaking subjects. Some research studies pointed out a lack of adequate grasp of derivational relationships, among children with DLD (Moats &Smith 1992).Children with DLD exhibit difficulty in applying morphological rules to unfamiliar words. Children with DLD seem to have great difficulty in organizing and accessing words (Freyd & Baron 1982, Nagy, Anderson, Scommer, Scott & Stellmen 1989). Ravid et al, (2003) studied Hebrew speaking children with DLD in which Children were asked to derive adjectives from random verbs and nouns in a production task. Results showed reduced morphological abilities,which were claimed to be attributed to difficulties in morphological generalizations.

2.4.1 Nouns

Some previous studies have examined vocabulary development in DLD children. In examining children with DLD, Fletcher and Peters (1984) and Rice et al. (1993), identified specific delays both in using their first words and in continuing to add new words to their lexicon at a slower pace than

children with TLD (Ravid et al 2000). Variations among children with DLD are common in this population (Leonard 1988).

Ravid, Avivi and Levy (2000), tested the production of novel nouns among Hebrew speaking grade school children with DLD and compared results with children with TLD. Their findings point to difficulty children with DLD had with the application of morphological knowledge in the production task. Most of the problems were in the ability to express categorical relations. (Ravid, et.al, 2000).

2.4.2 Verbs

Several studies have identified differences between children with TLD and children with DLD, especially in the way they use verbs. (Kelly & Rice 1994, Rice & Bode 1993 & Watkins, Rice and Moltz 1993). Fletcher and Peters (1984) pointed out to limitations in the verb lexicon of children with DLD. Children with DLD showed limited variety of verbs and produced fewer verbs than their age equivalent TLD group. Rice and Bode (1993) analyzed the spontaneous verb productions of three children with DLD. They reported that all three children used a small number of verbs repetitively. Some verb production studies showed that children with DLD produce smaller frequency and diversity of verbs than their age and their "MLU-equivalent peers," where MLU stands for the Mean Length of Utterance, a measure of linguistic productivity (Rice & Bode 1993, Watkins et al. 1993).

In conclusion, it seems reasonable to expect children with DLD to fare more poorly than their TLD peers, in both noun and verb domains. The domain of verb and noun derivational morphology has not been fully studied, in the Palestinian Arabic speaking population. The present study is the first such attempt to examine the production of both verb and noun morphology among PA speaking children with TLD and children with DLD.

3. Research Questions:

This study attempts to answer the following questions:

1. How are nouns and verbs derived by PA speaking children with TLD (ages 5-6 years old) and what impacts the choice of pattern?

2. How are nouns and verbs derived by PA speaking children with DLD (ages 5-6 years old) and what impacts choice of pattern?

3. How these two populations (children with TLD and children with DLD) compare to each other?

3.1 Hypotheses:

1. Children with TLD:

1.1: Consistent with research in other languages (Gentner 1978 &1982 & Bowerman 1971 & 1981,) children with TLD will do better with noun derivations than verb derivations**.**

1.2: Children will derive verbs from nouns by following the patterns CaCaC, CaCCaC, while preference will be for CaCCaC pattern.

1.3: Word frequency will have an impact on results.

2: Children with DLD:

2.1: Children with DLD are expected to have difficulties with both noun and verb tasks, due to their lack of adequate grasp of derivational relationships (Moats &Smith 1992) and due to difficulties in the application of morphological knowledge (Ravid, Avivi & Levy 2000).

2.2 They will do better with noun derivations than verb derivations.

2.3 Word frequency is expected to have an impact on results as in the TLD group.

3: Comparing task performance of Children with TLD with Children with DLD:

3.1 Children with TLD will do better than children with DLD, in both domains noun and verb derivations. The DLD population as mentioned earlier lacks the adequate knowledge of derivational relationships as well as the application of morphological knowledge.

3.2 The performance gaps between the two groups is expected to be less in the noun derivation domain than the verb domain.

3.3 Children with TLD will outperform children with DLD, in the domain of lexical innovation. This is due to difficulties experienced by DLD group in both application of morphological Knowledge.

4. Methodology
4.1 Subjects

60 PA speaking kindergarten children will be tested (N.60). 30 TLD and 30 DLD, at the age of 5.6 to 6.6 years old (Five and a half to Six and a half years old). The TLD children will be tested at a regular kindergarten setting, in Kufur Qasim town. The DLD children, (free of hearing, neurological or health problems but with language impairment problems) will be tested at a special kindergartens for language impaired children at Kufur Qasim, Kufur Bra, Jaljulia,Taybi and Tira towns. Children with DLD will be screened first professionally using a questionnaire for parents and the ALEF test to confirm existence of Developmental Language Disorder DLD. ALEF is (Arabic Language: Evaluation of Function) a language screening battery created by a US team and validated based on a normative sample of children 3–9 years old (Kornilov et al., 2016). It includes six tasks that were used to screen for DLD: word articulation, expressive vocabulary, non-word repetition, non-word discrimination, sentence completion, and sentence imitation task. Rapid naming using RAN for colors and Forward Digit Span were also used for screening (cited in Saiegh-Haddad, E., and Ghawi-Dakwar, O.2017). Last, testing the children will be done with permission from the ministry of education, schools' administrative staff and prior parent's informed consent.

4.2 Procedures

Children will be tested in two morphological awareness tasks, (production tasks): "word analogy task" (Bryant & Bindman 2006) and "Lexical innovation task" (Clark and Berman 1984).

4.2.1 Item Selection

Various resources were consulted for test items selection: A) The new Oxford Dictionary and "Your first 100 words in Arabic book. Series B) Tarabani's work (Tarabani 2006) and C) teachers' survey rating frequency.

Twenty kindergarten teachers, from Kufur Qasim town, helped in the selection the item selection of verbs and nouns. Teachers were asked to fill in a questionnaire rating the frequency of use of 250 verbs and 430 nouns, among children in their kindergarten, using a Likert scale for frequency (never: 1, rarely: 2, occasionally: 3, frequently: 4, very frequently: 5). The words were selected from "The new Oxford picture dictionary" and "Your first 100 words in Arabic" books. Item then were categorized as low and high frequency words items below 2.6 were considered as low frequency; items up to 3.4 were considered as high frequency. Items with frequency between 2.6 and 3.4 were excluded. All the nouns without a root in Arabic have been excluded. Moreover, in order to categorize Arabic nouns patterns in terms of frequency among children, the corpus for the word frequency (nouns) by "Lexical category dialect and variety among Arabic speakers" (Saiegh-Haddad, E. 2007) at different villages (such as Nahif and Kufur Qarea' in Israel) was consulted. Only high nouns patterns were included and low patterns were excluded. The following nouns patterns found to be high frequent among the above populations:

1. miCCaCi (miknsi-broom) a pattern for instrument nouns.

2. CaCaaCaC(a'lakah-hanger) a pattern for instrument nouns.

3. CaCCaC (najar-carpenter) a pattern for agent nouns.

Frequent Arabic verbs patterns among children were based on Tarabani (2006) and based on the kindergarten teachers' frequency assessment (See Appendix 5 for selected items).

4.2.2 Word Analogy Task

This task tests the child's ability to form verbs from nouns and nouns from verbs. Children will be presented with a model pair and will be required to generate the second half of the target pair by analogy based on previous one. The task includes real nouns and verbs with patterns of different degrees of frequency in PA and pseudo items. Frequency was determined by a survey of 20 teachers, randomly selected from children's schools, who rated degree of frequency on a scale of 1to5. The real items test lexically based knowledge, while the pseudo items test the ability to generalize the rule at the base of the analogy to unfamiliar words. Real items will include 18 verbs: 9 with high frequency, 9 with low frequency and 18 nouns: 9 with high frequency and 9 with low frequency. Pseudo words for verbs and noun have no meaning in Arabic and constructed by experimenter to sound like regular words. Pseudo words be will included and randomized with verbs and noun, 12 for noun patterns and 12 for verb patterns. (See appendix 1and 2). The items will be presented randomly across children.

The task will be presented with the support of a puppet and will include two experimental parts. The puppet says a noun and experimenter says the derived verb of the noun. Then, the puppet says a second noun (nouns with different patterns will be randomized) and the child is asked to give the derived verb, assuming that the child will make the same change to this word (noun) as the puppet has done with experimenter in the first item. The same procedure will be followed for the verb with transformation to nouns. Verbs with different patterns will be randomized. As the items are randomized, every time a child is presented with a new noun or verb, he/she will be exposed to a model on each pattern for each verb or noun that is presented.

4.2.3 Lexical Innovations Task

The aim is to elicit innovative or novel nouns and verbs, as in Clark and Hecht (1982) among children. The task includes 50 items (as questions: what would you call…?). For agent noun, 10 denominal nouns and10 deverbal nouns, a place 10 deverbal nouns, an instrument 10 deverbal nouns will be used. The children will be further asked to produce innovative answers (10 denominal new verbs) for other questions (for example agent noun) such as "what would a knight do? (See appendix 3). The items will be presented randomly across children and sometimes the experimenter will show the children a relevant picture for some items as a way of keeping them interested in the task, also the picture serve as prompts when children don't come up with any response (see appendix 4).

5. Contribution of the current study

There are no studies of derivational morphology, implemented for testing acquisition of verbs and nouns among children in PA. This is the first study, which attempts to cover this area. I hope that this study will chart a new research direction for linguists interested in spoken Arabic. Findings and language problems exposed in this study could possibly enable linguists and even speech therapists to test children's linguistic abilities and to find linguistic treatment in future research for DLD children. Finally, the current study could serve as a platform for designing and stimulating further research in this area, among Arabic speaking children who are either typically developed or with specific language impairment

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Appendix 1: Word analogy task-Nouns (Randomized verbs)

	Pseudo words	
الجواب(الاسم)	الفعل	
	1.رشب*	
	2.فسل*	
	3.لسّح*	
	4.نرز*	
	5.طفَع*	
	6.عشّط*	
	7.فعج*	
	8.فخز*	
	9.رسّع*	
	10.دفل*	
	11.تنب*	
	12.بخل*	

(Note: starred items are pseudo word)

الجواب(الاسم) answer	الفعل Verb
	1.علّك
	2.غرف
	3.عجن
	4.سجن
	5.فلح
	6.غسل
	7.رسم
	8.قطّر
	9.خبز
	10.قشّط
	11.خلّط
	12.درس
	13.قطّع
	14.مشّط
	15.طحن
	16.طبخ
	17.فرم
	18.جرد

Appendix 2: Word analogy task-Verbs (Randomized Nouns)

الجواب(الفعل) answer	الاسم nouns
	1. تنكيف
	2.جزّار
	3.تلوين
	4.تقليب
	5.طحّان
	6.تعطير
	7.توزيع
	8.تاخير
	9.سرّاك
	10.تسحيج
	11.تسطير
	12.نحّات
	13. تقسيم
	14.حلّاك
	15.تربيع
	16. جلّاد
	17.تزيين
	18.تحميم

Pseudo words	
الجواب(الفعل)	الاسم
	1.تغليس*
	2. نسّاع *
	3.تحسيل*
	4.تلسيب*
	5.فنّاط *
	6.تخفين*
	7.طفّاع*
	8.ترميس*
	9.تفخيل*
	10.تخفيز*
	11.عطّاش*
	12.ترخيز*

(Note: starred items are pseudo words)

Appendix 3: lexical innovation task (Randomized items)

الجواب answer	السؤال question	الجواب answer	السؤال question
	26.شو بنسمي الي بعمل القلم؟		1.شو بنسمي الي بعمل الجلد؟
	27.شو بعمل الطالب؟		2.شو بنسمي الي بعمل الشباك؟
	28.شو بنعمل بالبرميل؟		3.شو بنستعمل عشان نخزق؟
	29.شو بنسمي المحل الي بنعمل عطر؟		4.شو بنسمي الي بوسخ الاشياء؟
	30.شو بعمل النادل؟		5.شو بنعمل بالدفتر؟
	31.شو بعمل الفارس؟		6.شو بنسمي الي بعمل العجل؟
	32.شو بنسمي الي بعمل الزر؟		7.شو بعمل السايغ؟
	33.شو بنسمي الي بخلع الاشياء؟		8.شو بنسمي المحل الي بنعمل فيه صوف؟
	34.شو بنستعمل عشان نكسر؟		9.شو بنسمي المحل الي بنعمل فيه زبده؟
	35.شو بنستعمل عشان نعشب؟		10.شو بنستعمل عشان نربط ؟
	36.شو بنسمي الي بحلب الاشياء؟		11.شو بنسمي المحل الي بنعمل فيه حليب؟
	37.شو بنسمي الي بلقط الاشياء؟		12.شو بنسمي الي بعمل الحبر؟
	38.شو بنسمي المحل الي بنعمل فيه كحل؟		13.شو بنسمي الي بعمل الدبوس؟
	39.شو بنسمي الي بغلف الاشياء؟		14.شو بنسمي المحل الي بنعمل فيه جبنه؟
	40.شو بنسمي المحل الي بنعمل فيه لبنه؟		15.شو بنستعمل عشان نصفط ؟
	41.شو بنسمي المحل الي بنعمل فيه بهار؟		16.شو بعمل الراهب؟
	42.شو بنستعمل عشان نطرز؟		17.شو بنسمي الي بكسر الاشياء؟
	43.شو بنستعمل عشان نجر؟		18.شو بنعمل بالمنديل؟
	44.شو بنستعمل عشان نسحب؟		19.شو بنسمي الي بملح الاشياء؟
	45.شو بنسمي المحل الي بنعمل فيه ورق؟		20.شو بنسمي الي بعمل العلم؟
	46.شو بنسمي الي بعمل الذهب؟		21.شو بنسمي الي بمزع الاشياء؟
	47.شو بنستعمل عشان نحزق؟		22.شو بنعمل بالبشكير؟
	48.شو بنسمي المحل الي بنعمل فيه بزر؟		23.شو بنسمي الي بعلق الاشياء؟
	49.شو بنسمي الي بلبس الاشياء؟		24.شو بنستعمل عشان نلمع؟
	50.شو بنعمل بالطبشوره؟		25.شو بنسمي الي بعمل ورق؟

Appendix 4: Pictures included in the lexical innovation task
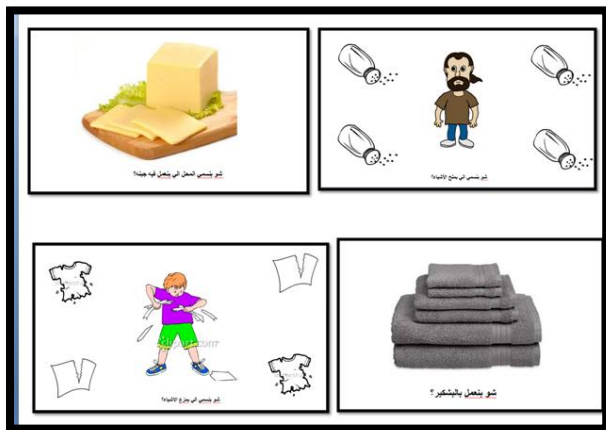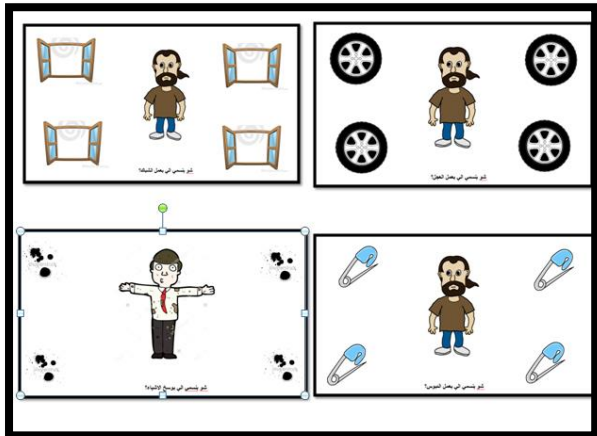
Appendix 5: Tables for the non-randomized items for the analogy tasks /Lexical innovation task

High and Low Frequency Words for high frequency patterns / Nouns Word Analogy Task

miCCaCi مِفعِله High Frequency

High frequent words

مثال: كنس - مكنسه

1) طحن ـــــــــــ (مطحنه CR)
2) درس ـــــــــــ (مدرسه CR)
3) جرد ـــــــــــ (مجرده CR)

Low frequent words

4) غرف ـــــــــــ (مغرفه CR)
5) فرم ـــــــــــ (مفرمه CR)
6) غسل ـــــــــــ (مغسله CR)

CaCaaCaC فعّاله High Frequency

High frequent words

مثال: عصّر عصّاره

1) مشّط ـــــــــــ (مشاطه CR)
2) علّك ـــــــــــ (علاكه CR)
3) خلّط ـــــــــــ (خلاطه CR)

Low frequent words

4) قشّط ـــــــــــ (قشاطه CR)
5) قطّع ـــــــــــ (قطاعه CR)
6) قطّر ـــــــــــ (قطاره CR)

CaCCaC فعّال High Frequency

High frequent words

مثال: رقص رقّاص

1) خبز ـــــــــــ (خبّاز CR)
2) طبخ ـــــــــــ (طبّاخ CR)
3) رسم ـــــــــــ (رسّام CR)

Low frequent words

1) سجن ـــــــــــ (سجّان CR)
2) عجن ـــــــــــ (عجّان CR)
3) فلح ـــــــــــ (فلّاح CR)

Pseudo words CaCCaC/فعّال	Pseudo words CaCaaCaC/ فعّاله	Pseudo words miCCaCi/ مِفعِله
1) رشب رشّاب (CR)	1) عشّط عشاطه (CR)	1) فخز مفخزه (CR)
2) دفل دفّال (CR)	2) طفّع طفاعه (CR)	2) بخل مبخله (CR)
3) تنب تنّاب (CR)	3) رسّع رساعّه (CR)	3) فسل مفسله (CR)
4) فعج فعّاج (CR)	4) لسّح لساحّه (CR)	4) نرز منرزه (CR)

CaCCaC High Frequency فعّل

High frequent words

مثال: تصوير صوَّر

1) تسحيج _____ (سحّج CR)

2) تلوين _____ (لوّن CR)

3) تسطير _____ (سطّر CR)

Low frequent words

1) تقسيم _____ (قسّم CR)

2) تزيين _____ (زيّن CR)

3) تقليب _____ (قلّب CR)

CaCaC High Frequency فعل

High frequent words

مثال: دهّان painter دهن painted

1) حلّاك _____ (حلّك CR)

2) سرّاك _____ (سرك CR) ٥٥٥٥٥

3) طحّان _____ (طحن CR)

Low frequent words

1) جزّار _____ (جزر CR)

2) نحّات _____ (نحت CR)

3) جلّاد _____ (جلد CR)

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itCaCCal High Frequency اتفعل

High frequent words

مثال: تحريك (movement)- اتحرك Moved

1) تنكيف _____ (اتنكف CR)

2) تاخير _____ (اتاخر CR)

3) تحميم _____ (اتحمم CR)

Low frequent words

1) تربيع _____ (اتربع CR)

2) توزيع _____ (اتوزع CR)

3) تعطير _____ (اتعطر CR)

Pseudo words **itCaCCal / اتفعل**	**Pseudo words** **CaCaC / فعل**	**Pseudo words** **CaCCaC / فعّل**
1) ترخيز اترخّز (CR)	1) عطّاش عطش (CR)	1) تخفين خفّن (CR)
2) تفخيل اتفخّل (CR)	2) طفّاع طفع (CR)	2) تحسيل حسّل (CR)
3) تلسيب اتلسّب (CR)	3) نسّاع نسع (CR)	3) تغليس غلّس (CR)
4) ترميس اترمّس (CR)	4) فنّاط فنط (CR)	4) تخفيز خفّز (CR)

2) Lexical innovation / word formation

*Denominal Noun Formation(Clark and Beman,1984)
(the verb "make" or "do" + a noun)
*Coining novel nouns from an established verb

1.شو بنسمي الي بعمل زر؟ What would you call someone who makes a button?
2.شو بنسمي الي بعمل دبوس؟ What do would you call someone who makes a pin?
3.شو بنسمي الي بعمل علم؟ What would you call someone who makes a flag?
4.شو بنسمي الي بعمل حبر؟ What would you call someone who makes ink?
5.شو بنسمي الي بعمل ذهب؟ What would you call someone who makes gold?
6.شو بنسمي الي بعمل جلد؟ What would you call someone who makes leather?
7.شو بنسمي الي بعمل ورق؟ What would you call someone who makes a paper?
8.شو بنسمي الي بعمل شباك؟ What would you call someone who makes a window?
9.شو بنسمي الي بعمل عجل؟ What would you call someone who makes a wheel?
10.شو بنسمي الي بعمل قلم؟ What would you call someone who makes a pencil?

*Deverbal Noun Formation/ agent (Clark and Beman,1984)
Coining novel nouns from different established verbs (a verb +a noun)

1.شو بنسمي الي بملح الاشياء؟ What would we call someone who puts salt on things?
2.شو بنسمي الي بوسخ الاشياء؟ What would we call someone who dirt things?
3.شو بنسمي الي بعلق الاشياء؟ What would you call someone who hangs things?
4.شو بنسمي الي بمزع الاشياء؟ What would we call someone who tears things?
5.شو بنسمي الي بلقط الاشياء؟ What would we call someone who picks things?
6.شو بنسمي الي بحلب الاشياء؟ What would we call someone who milks things?
7.شو بنسمي الي بغلف الاشياء؟ What would you call someone who pours things?
8.شو بنسمي الي بخلع الاشياء؟ What would you call someone who cuts (by roots) things?
9. شو بنسمي الي بلبس الاشياء؟ What would we call someone who clothes things?
10.شو بنسمي الي بكسر الاشياء؟ What would you call someone who breaks things?

Coining novel nouns from different established verbs (deverbal noun / place)

1.شو بنسمي المحل الي بنعمل فيه لبنه؟ What would you call a place that we make yogurt in?
2.شو بنسمي المحل الي بنعمل فيه زبده؟ What would you call a place that we make butter in?
3.شو بنسمي المحل الي بنعمل فيه جبنه؟ What would you call a place that that we make cheese in?
4.شو بنسمي المحل الي بنعمل فيه بهار؟ What would you call a place that we make spices in?
5.شو بنسمي المحل الي بنعمل فيه عطر؟ What would you call a place that we make perfume in?
6.شو بنسمي المحل الي بنعمل فيه صوف؟ What would you call a place that we make wools in?
7.شو بنسمي المحل الي بنعمل فيه ورق؟ What would you call a place that we make papers in?
8.شو بنسمي المحل الي بنعمل فيه حليب؟ What would you call a place that we make milk in?
9. شو بنسمي المحل الي بنعمل فيه بزر؟ What would you call a place that we make sunburn in?
10.شو بنسمي المحل الي بنعمل فيه كحل؟ What would you call a place that we make kohol in?

*Denominal Noun Formation(Clark and Beman,1984)

Coining novel nouns from different established verbs (deverbal noun /Instrument)
1.شو بنستعمل عشان نطرز؟What do we use to embroider?
2.شو بنستعمل عشان نكسر؟What do we use to break things?
3.شو بنستعمل عشان نجر؟   What do we use to tow/drag thing?
4.شو بنستعمل عشان نخزق؟   What do we use to make holes?
5.شو بنستعمل عشان نحزق؟What do we use to tie things?
6.شو بنستعمل عشان نسحب؟What do we use to pull things?
7.شو بنستعمل عشان نعشب؟What do we use to weed things?
8.شو بنستعمل عشان نربط What do we use to connect things?
9.شو بنستعمل عشان نصفط What do we use to arrange things?
10.شو بنستعمل عشان نلمع؟What do we use to bright things?

Denominal verbs

1.شو بعمل الفارس؟What does a knight do?

2.شو بعمل الطالب؟ What does a pupil do?

3.شو بعمل السايغ؟ What does a jeweler do

4. شو بعمل الراهب؟   What does a priest do?

5. شو بعمل النادل؟ What does a waiter do?

6.شو بنعمل بالمنديل؟ What would we do with a scarf?

7. شو بنعمل بالبشكير؟ What would we do with a towel?

8.شو بنعمل بالبرميل؟ What would we do with a barrel?

9.شو بنعمل بالطبشوره؟؟What would we do with a chalk?

10. شو بنعمل بالدفتر ؟ What would we do with a notebook?