

## The Effect of Sentential Load, Semantic Relatedness/Unrelatedness, and Sex on Depth of Lexical-Semantic Processing in L1 and L2 reading

Marwa Mekni Toujani

Higher Institute of Languages, Tunis, Tunisia

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**ABSTRACT:** Three experiments based on the text-change paradigm examined the effect of sentential load, semantic relatedness/unrelatedness, and sex on depth of lexical-semantic processing in L1 and L2 reading. Experiment 1 and 2 showed that there is no significant effect of sentential load on depth of lexical-semantic processing in L1 and L2 reading. On the other hand, they confirmed the existence of a significant effect of semantic relatedness/unrelatedness on depth of lexical-semantic processing in L1 and L2 reading. Experiment 3 consolidated the results obtained from experiment 1 and 2 and revealed that load is neither localized at the embedded verb nor at the adverb phrase positions. Finally, sex proved not to have an effect on depth of lexical-semantic processing in L1 and L2 reading. The present study showed that all embedded relative clauses and not just object-extracted relative clauses decrease deep processing.

**KEYWORDS:** Depth of lexical-semantic processing, shallow, deep, underspecification, sentential load, syntactic complexity, referential load, semantic relatedness/unrelatedness.

### 1 INTRODUCTION

Most linguistic studies on natural language processing (e.g. Gibson & Pearlmuter, 1998; Altmann, 1998; Tanenhaus et al., 1995; Altmann & Steadman, 1988, cited in Ball, Freiman, Rodgers, and Myers, 2010) have argued that language processing in general and syntactic and lexical-semantic processing in particular are complete, fast, and accurate. That's to say, "syntactic, semantic, and pragmatic processing of a word is done while the eyes are fixated on that word or while that word is being heard" (Rayner & Clifton, 2009, p.1). This view is also adopted by most psycholinguists (e.g. Altman, Kamide & Haywood, 2003; Van Berkum et al., 2005; Staub & Clifton, 2006, cited in Demberg, 2011) who "assume that [lexical-semantic processing] generates complete, detailed, and accurate representations of the linguistic input" (Ferreira, Bailey & Ferraro, 2002, p.11). However, Sanford and Sturt (2002) proved that lexical-semantic processing is not always incremental and it is sometimes incomplete. In other words, lexical-semantic processing is not always uniform as some words' meanings are processed deeper than others are. Consequently, they developed depth of lexical-semantic processing theory.

Prior to getting a deep analysis of depth of lexical-semantic processing theory, it is worth mentioning that the notion of depth of processing has appeared in two domains of research which are memory research in the field of cognitive psychology and language comprehension research in psycholinguistics. Wang, Bastiansen, Yang, and Hagoort (2011) affirm that the meaning of depth of processing is not the same in the aforementioned domains. The present paper is concerned with depth of lexical-semantic processing as defined in the psycholinguistic literature.

### 2 EVIDENCE FOR DEPTH OF LEXICAL-SEMANTIC PROCESSING THEORY

There are mainly three types of evidence that do emphasize that lexical-semantic processing is not always deep and that do back the phenomenon of shallow processing. These evidence are findings of other fields such as formal semantics, computational linguistics, and human language understanding. They have proved that words are not always processed in an incremental fashion (Sanford & Sturt, 2002).

In fact, studies on formal semantics (e.g. Erickson and Matteson, 1981) affirm that people seem to get the global meaning of the discourse at hand prior to the local meaning of its parts and do not always process each word they read or listen to with the same depth (*ibid*). Inspired by Erickson and Matteson's (1981) study, Barton and Sanford (1993) investigated the detection of semantic anomalies in language comprehension literature by testing the "survivors' anomaly" (Sanford & Sturt, 2002, p.384). In fact, most of their participants did not notice the anomaly in the following question "after an air crash, where should the survivors be buried?" (Barton & Sanford, 1993, cited in Sturt, Sanford, Stewart, and Dawydiak, 2004, p. 882) and gave an answer like "burry them where their relatives want" (Sanford & Sturt, 2002, p. 384). Therefore, these participants did not detect that survivors are living people and that normally we do not burry living people (Sanford, Sanford, Filik, and Molle, 2005). However, the same anomaly can be detected in a bicycle crash context as the following: "After a bicycle crash context, where should the survivors be buried" (Barton & Sanford, 1993, cited in Sturt et al., 2004, p. 882) because, in this situation, dead people are not frequent and survival is the norm. Accordingly, when the word fits the global context, it can be processed less deeply than when it does not, which gives rise to the occurrence of shallow processing.

Similarly, computational linguists contend that language processing varies in depth depending on the purpose of the processor (Sanford & Sturt, 2002). For instance, while automatic translation requires deep processing, shallow processing can be efficient for the automatic generation of indexes for large texts (*ibid*). In fact, "the computational system underspecifies initially and fills in information if the details become relevant" (Ferreira & Patson, 2007, p. 73). That's to say, underspecified representations are initially computed, and then in the presence of other information like syntactic preferences, world knowledge topic/focus, deep processing occurs (Ferreira & Patson, 2007). For example, there are two readings for a sentence such as (1): (1) there is one boy and many girls and (2) there are as many boys as girls. Nevertheless, computational systems do not make the distinction between the two readings from the beginning and wait till further contextual cues are provided, which gives rise to shallow parsing. In other occasions, as the one illustrated in (2), it would be unacceptable that one can understand that there is one and only one single bath "at the end of the corridor" (Paterson, 2010, p. 31). Thus, such sentence requires obviously deep processing i.e. "full-sentence parsing" (Palmović, 2007, p. 28) right from the beginning and computational systems should not wait for further contextual cues to make decisions.

(1) A boy hit every girl.

(2) 'Every room has a bath'-while booking a room in a hotel.

(Source: Paterson, 2010, p. 31)

Studies on human language understanding suggest that there are certain circumstances when people resort firstly to shallow processing rather than deep processing; and consequently, form only underspecified representations. Then, when contextual clues are available, they process information more deeply; and therefore, form complete representations. For instance, Frazier, Pacht and Rayner (1999) argue that a sentence like (3) is open to two interpretations: (1) Mary saved 100\$ and also John saved 100\$; (2) Jane and Mary saved together 100\$ (cited in Ferreira & Patson, 2007, p. 73). Nonetheless, people, reading or listening to such sentence, cannot immediately choose one of the previous alternatives till they are provided with further context (*ibid*) (see 4).

(3) Mary and John saved 100\$.

(4) Mary bought a present to her mother by her 100\$.

## 2.1 Focus

Sanford et al. (2005) argue that lexical-semantic processing can be either deep or shallow depending on two main factors which are focus and sentential load. Focus is about highlighting a piece of information through linguistic devices or contextual cues or prosodic features or orthographic devices. Bredart and Modolo (1988) were the first to investigate the relationship between focus and lexical-semantic processing using Erickson and Matteson's (1981) Moses illusion example in the domain of formal semantics (Sturt et al., 2004). They argue that the semantic anomaly was only detected when the Moses illusion sentence was put in a cleft construction (5) (*ibid*). Sturt et al. (2004) extended the previous study to the domain of discourse comprehension and studied the effect of focus on the extent of lexical-semantic processing by means of text-change paradigm which was designed specifically for this purpose. Their study showed that focus has a direct effect on depth of lexical-semantic processing in a sense that focused pieces of information enhance deep processing.

(5) It was Moses who put two of each kind of animals on the Ark.

(Source: Sanford et al., 2005, p. 379)

## 2.2 SENTENTIAL LOAD

Sanford et al. (2005) argue that sentential load does affect depth of lexical-semantic processing. Sentential load can be perceived as the sum of syntactic complexity and referential load. More precisely, syntactic complexity is manipulated through contrasting sentences containing subject-extracted relative clauses (6) (i.e. low loaded sentences) and object-extracted relative clauses (7) (i.e. high loaded sentences). Referential load is manipulated through contrasting the use of indexical pronouns (8) (i.e. low loaded) or full NPs (9) (i.e. high loaded) in subject position of object-extracted relative clauses. Sentential load is of particular interest to the current paper as it aims at exploring its effect on the extent of lexical-semantic processing in both L1 and L2 reading.

(6) The reporter who sent the photographer hoped for a story

(7) The reporter who the photographer sent hoped for a story.

(8) The reporter who I sent hoped for a story.

Indexical pronoun ←

(9) The reporter who the photographer sent hoped for a story.

Full NP ←

(Source: Sanford et al., 2005, p. 380)

### 2.2.1 SYNTACTIC COMPLEXITY

Several studies (Chomsky, 1957, 1965; Chomsky & Miller, 1963; Miller & Chomsky, 1963; Miller & Isard, 1964; Yngve, 1960; cited in Warren & Gibson, 2002) have affirmed that “nested (or center-embedded) syntactic structures are more difficult to process than non-nested structures” (Gibson & Warren, 2002, p. 80). In other words, complex sentences, e.g. sentences containing relative clauses are more difficult than simple sentences. However, it has been argued that not all relative clauses are equally difficult to process.

Gibson (1998) affirms that a plethora of measurements such as phoneme monitoring, online decision, reading time, and response accuracy, ERP, etc. proved that object-extracted relative clauses are more difficult to process than subject-extracted relative clauses. Additionally, Mak, Vonk and Schriefers (2002) argue that, according to the relative clause literature, subject-extracted relative clauses are easier to process than object-extracted relative clauses generally in most languages, namely English, French, German, and Dutch. Despite the large body of literature on relative clauses’ complexity worldwide, relative clauses’ processing, from this perspective, is under explored in Tunisian Arabic. Therefore, it is the aim of the present paper to document Tunisian Arabic as far as processing studies are concerned.

However, Carreirasa, Duñabeitia, Vergara, de la Cruz-Pavía, and Laka (2010), investigating the Basque language, argue that the previous conclusion, which is object-extracted relative clauses are more difficult to process than subject-extracted relative clauses, cannot be always considered as a fact. They showed that “subject relative clauses are not universally easier to process” (p. 1) since they found that subject-extracted relative clauses are harder to process than object-extracted relative clauses in Basque. They explained that Basque differ structurally from other investigated languages such as English, French, Dutch, German, and Spanish in a sense that Basque is an ergative-absolutive language and the others are nominative-accusative languages. In Basque, “relative clauses precede their head nouns” (Carreirasa et al., 2010, p. 83); however, in French, English, Spanish, etc. relative clauses follow the head nouns and are generally introduced by a relative pronoun (ibid). It can be concluded that subject-extracted relative clauses are easier to process than object-extracted relative clauses only for nominative-accusative languages.

As far as this paper is concerned, the effect of syntactic complexity on depth of lexical-semantic processing will be studied regarding two languages which are English and Tunisian Arabic. Concerning English, a plethora of studies (Caplan et al., 2002 ; Ford, 1983 ; Gibson et al., 1994; Gordon et al., 2001; King & Just, 1991 ; King & Kutas, 1995 ; Pickering, 1994; Traxler et al., 2002; Weckerly & Kutas, 1999; Cohen & Mehler, 1996 ; Frauenfelder et al., 1980 and Holmes & O’Regan, 1981, cited in Carreirasa et al., 2010) confirmed that object-extracted relative clauses are harder to process than subject-extracted relative clauses. Therefore, the problematic case seems to be Tunisian Arabic as it is an under explored language. However, one can postulate that Tunisian Arabic rhymes with nominative-accusative languages such as English since, in Tunisian Arabic, relative clauses also follow the head noun and are generally introduced by a relative pronoun “illi” (10). Ultimately, in the present

study, object-extracted relative clauses are presumed to be more difficult to process than subject-extracted relative clauses in Tunisian Arabic.

(10) Haidar šef ir-ražil illi ža

(Source: Ghodbani, 2005, pp .46-47, cited in Arfaoui, 2011, p. 15)

The relationship between syntactic complexity and depth of lexical-semantic processing is evidenced by studies about garden path effects (e.g. Ferreira & Clifton, 1986 and Trueswell et al., 1994; cited in Sanford et al., 2005). Those studies “suggest that when parsing becomes difficult, processing may be shallow” (Sanford, 2002, p. 199). This paper aims at investigating the effect of syntactic complexity on depth of lexical-semantic processing through comparing high loaded sentences i.e. sentences containing object-extracted relative clauses to low loaded sentences i.e. sentences containing subject-extracted relative clauses.

### 2.2.2 REFERENTIAL LOAD

As stated earlier, object-extracted relative clauses are more difficult to process than subject- extracted relative clauses; however, not all object-extracted relative clauses are believed to be equally hard to process (Sanford et al, 2005). In fact, it is argued that object-extracted relative clauses introduced by indexical pronouns “I” and “you” (11) are easier to process than those introduced by full NPs (12) (ibid). The present study tends to explore the effect of referential load on depth of lexical-semantic processing through comparing high loaded sentences i.e. sentences containing object-extracted relative clauses introduced by a full NP to low loaded sentences i.e. sentences containing object-extracted relative clauses introduced by indexical pronouns.

(11) The professor who I had recently met at a party was famous, but no-one could work out why.

(12) The professor who the student had recently met at a party was famous, but no-one could work out why.

(Source: Sanford et al., 2005, p.381)

Gundel, Hedberg, and Zacharski’s (1993) Givenness Hierarchy theory explains why indexical pronouns reduce the processing load of object-extracted relative clauses (cited in Warren & Gibson, 2002). According to this theory, referents are ranked from central to peripheral ones. Central referents are easier to process than peripheral referents. It also states that the accessibility of a referent of an NP in discourse determines its processing load (ibid). In other words, it advocates that central referents such as the referents of indexical pronouns are more accessible than peripheral ones like those of full NPs because indexical pronouns have known referents in each type of discourse while full NPs are either newly introduced or found in long-term memory and thus relatively inaccessible (ibid). To sum up, the Givenness Hierarchy Theory emphasizes the idea that accessing indexical pronouns are low loaded than full NPs since their referents are more easily accessible than those of full NPs.

Both focus and load are related to a third factor which is semantic relatedness/unrelatedness (Sanford et al., 2005). On the one hand, when a piece of information is focused, changes to semantically similar words are more detected than changes to semantically distant words (Sturt, Sanford, Stewart, and Dawydiak, 2004). On the other hand, changes to semantically distant words are more detected than changes to semantically similar ones when a piece of information is under sentential load (Sanford et al., 2005). This issue will also be treated in this paper.

Sanford et al. (2005) argue that difficulty in processing object-extracted relative clauses introduced by full NPs is not spread and it is strictly localized to a certain position. They claim that there is “a well-understood sentential locus [where sentential load is high] and where complexity effects influence processing” (p. 381). In fact, Warren and Gibson (2002) and Sanford et al. (2005) found that sentential load occurs only at the embedded verb and not at adverb or other NPs positions; and do not affect adjacent loci as participants found difficulties only at the integration site of the embedded verb. This issue will be treated in this paper by manipulating changes at the embedded verb position and at the adverb phrase position.

## 3 LOAD AND LEXICAL REPRESENTATIONS

Focus and sentential load are believed to affect lexical-semantic processing but in a different way. Therefore, we are interested in presenting the three main theories which try to answer the following question: “what does load do to lexical representations?” (Sanford et al., 2005, p.390). These theories are Granularity Theory of Focus, Capacity Theory of Comprehension, and Good Enough Representation Theory.

Sturt et al. (2004) found that granularity theory is sensitive to focus developed by Hobbs (1985). When a word is in focus and changed to another word which is semantically close, the change was easily detected since the word is presented at a more detailed level (Sanford et al., 2005). Conversely, when a word is not in focus, i.e. presented at rougher details, detection rates for semantically similar changes fell (ibid). Thus, focus enhances the detection of close semantic changes rather than the detection of distant semantic changes. However, sentential load is not related to Granularity Theory of focus. The Granularity Theory of focus does not interpret the relationship between load and lexical representation as load is not an active variable in this theory.

In 1992, Just and Carpenter developed the Capacity Theory of Comprehension, a theory about memory resources. They claim that understanding a piece of discourse at hand involves the integration of both syntactic and semantic information, which consumes memory resources (Just & Carpenter, 1992). This theory states that short-term memory is constrained and its storage and computational functions are degraded when the task demands exceed the available resources (Just & Carpenter, 1992). That's why Sanford et al. (2005) argue that when a sentence is complex, it pushes memory resources spent on semantic analysis "to be well compromised" leading to shallow processing of the semantics of that sentence.

The Good Enough Representation theory (2002) assumes that lexical-semantic representations which are often underspecified can be perceived as "just good enough" i.e. sufficient for completing the task at hand (Ferreira et al., 2002). Ferreira et al. (2002) argue that "good enough representations" arise in case of time pressure and mainly resource constraints (e.g. complex sentences, ambiguous sentences).

#### **4 PREVIOUS EMPIRICAL STUDIES**

Only few studies have investigated depth of lexical-semantic processing worldwide. Nonetheless, there are some sound empirical studies done to explore this phenomenon and to probe the effects of focus and sentential load on this notion either in reading or listening.

Sturt, Sanford, Steward, and Dawydiak (2004) engaged in a study about the effect of linguistic focus on depth of lexical-semantic processing. Their study revealed that both focus and semantic distance have an effect on detection of changes i.e. change detection rates were high when the word is in focus. Furthermore, they found that focus and semantic similarity/distance interact in a sense that "focus made a significant difference when the change was to [a semantically related] word, but had no effect when the change was to a semantically unrelated word" (Sturt et al., 2004, p.886). Their interpretations of the results were in line with the Granularity Theory of Focus and the Good Enough Representation theory.

Sanford, Molle, Sanford, and Healy (2004) conducted a study about the effects of both focus and referential load on the extent of lexical-semantic processing in the English language Listening (L1). They used Sturt's et al. (2004) text-change detection task using auditory presentations. They manipulated, on the one hand, focus via prior context, and referential load and semantic distance on the other hand. Sanford et al. (2004) found an interaction between focused information and change detection rates with "fewer change detections in unfocused information [were noticed] when the target word was changed to semantically similar words" (p.1). They also found an interaction between focus and semantic relatedness/unrelatedness. The aforementioned results were, therefore, in line with the granularity Theory of focus.

Wang, Bastiansen, Yang, and Hagoort (2011) investigated also the influence of information structure (i.e. both linguistic and prosodic devices of focus) on depth of lexical-semantic processing in listening in Dutch (L1) through ERP experiments. This study revealed that accentuated focused words were processed more deeply compared to other conditions where there was a mismatch between focus and accentuation. Additionally, the researchers noticed sex differences regarding depth of lexical-semantic processing as females tended to engage in more elaborate lexical-semantic processing compared to males. Wang et al. (2011) argue that, except for their study, sex differences in semantic processing is an under-researched issue; and therefore, this issue deserves further investigation. Thus, it is one of the endeavors of the present study to dig into this issue in the Tunisian context.

#### **5 EXPERIMENTAL QUESTIONS AND EXPERIMENTS**

To meet its aim, the current paper aspires at answering the following questions: (1) Does sentential load have an effect on depth of lexical-semantic processing in L1 and in L2 reading? (2) Does semantic relatedness/unrelatedness have an effect on depth of lexical-semantic processing in L1 and in L2 reading? (3) Where is the locus of processing load? and lastly (4) Does sex have an effect on depth of lexical-semantic processing?

To find an answer for the research questions stated earlier, three experiments based on the text-change paradigm were used. This task, developed by Sturt et al. (2004), was inspired by the change-blindness paradigm. This paradigm was “used for detecting changes in complex visual scenes, where failures to detect changes have been taken as indicative of inattention” in studies about visual memory (e.g., Hollingworth & Henderson, 2002; Hollingworth et al., 2001; and Simons & Levin, 1997 cited in Sanford et al., 2005, p. 379).

### Experiment 1

This experiment aims at exploring the effects of syntactic complexity and semantic relatedness/unrelatedness on depth of lexical-semantic processing in L1 and in L2 reading. Syntactic complexity was manipulated by comparing object-extracted (high load) and subject-extracted (low load) relative clauses. Semantic relatedness/unrelatedness was assessed by changing the embedded verb to either a semantically related or a semantically unrelated word (see Appendix A). The locus of the change was at the level of the embedded verb.

#### **Method**

##### **Design and materials**

Experiment 1 was composed of two parts: Part (A) was about the English Language and Part (B) was about Tunisian Arabic. The 24 experimental materials used in this experiment were adapted from Sanford et al. (2005). There were 24 experimental items and 48 fillers in the English part and also 24 experimental items and 48 fillers in the Tunisian Arabic part, too. Each experimental item had a core sentence containing an embedded clause that could be either a subject (13) or an object-extracted relative clause (14), an introductory sentence and a concluding sentence (see Appendix A, Table 1). Sanford et al. (2005) themselves adopted the core sentences from Gibson (1998) but added the introductory and the concluding sentences. The fillers used in this experiment were adapted from Spivey-Knowlton, Trueswell, and Tanenhaus (1993), Sturt (2003) and Sanford et al.’s (2005) experimental items of experiment 2. 18 items of fillers matched the experimental items in structure. The other 30 items had different structures at the level of core sentences such as simple sentences but they had also introductory and concluding sentences (15).

(13) There are strict rules about the correct form of behavior at a royal court. The suitors who amused the king wanted to see the princess. Many people seek professional guidance before they appear at a royal event.

(14) The workmen had all worked together on previous projects. The carpenter who the plumber hit yelled at the painter. Usually, they were a good team but this time it seemed to be going badly.

(15) A patient and her son were waiting for their doctor to introduce them to the team of specialists. The doctor presented the patient to them but not the son. The patient felt embarrassed for getting all the attention.

There were four versions of the materials presented in each part. Each version contains high loaded semantically distant items (HLSD), high loaded semantically similar items (HLSS), low loaded semantically distant items (LLSD) and low loaded semantically similar items (LLSS). Finally, to avoid length problems and the occurrence of the same item in both languages, each version is divided into three subversions provided that Item 1 in English in the first subversion is in Tunisian Arabic in the second subversion. Each subversion includes eight experimental items and 16 fillers in the English part and also eight experimental items and 16 fillers in the Tunisian Arabic part. Concerning the fillers, while 6 fillers matched the experimental items in structures, the other ten had other structures at the level of core sentences. Moreover, the fillers that matched the experimental items in structure didn’t include any change. As far as the other fillers are concerned, some of them included changes and others did not. Ultimately, there were 14 changed materials (both experimental items and fillers) and 10 unchanged ones (fillers) in each part of a subversion.

##### **Participants**

Twenty-four Tunisian students of English who were enrolled at Master classes were the subjects of this study. All subjects’ native language was Tunisian Arabic and their L2 were both French and English. 47 were females and 25 were males. Their ages ranged from 22 to 25.

##### **Procedure**

The materials of the experiments were presented on a portable computer using Microsoft PowerPoint. The first presentation of each pair of materials was in black, in Time New Roman size 32, on a white background. The second presentation was also in black but in Ariel size 32, on a white background. Using two different fonts was meant to disable participants from recognizing the loci of changes right from the appearance of the materials. After the appearance of the two presentations of the materials, a blank screen would appear.

Before starting the experiments, participants were orally instructed that they were going to read texts composed of three sentences. Each piece of text would appear twice, and the students' task was to inform the experimenter if they noticed any change between the first and the second presentation. Students read the texts at their own pace and are told to read the texts as naturally as possible to imitate natural conditions of reading and were also instructed not to re-read a text once they had passed through it. When they pressed the return key, the first piece of text appeared. Once they had read the text, they pressed the return key again and they read the second presentation of the text. When they finished reading the two presentations, they pressed the return key again, the blank screen appeared and they were instructed to report any change noticed. If they noticed any change, they were asked to say as precisely as possible what the change had been, and if not to say 'no change'. This procedure was repeated till the end of the whole set of presentations.

**Results and discussion**

It has been firstly hypothesized that increased syntactic complexity decreases detection of word changes in reading in English and in Tunisian Arabic. To test these hypotheses, 2 (syntactic complexity: High load vs. Low load) x 2 (semantic relatedness/unrelatedness: semantically similar vs. semantically distant) Repeated Measure ANOVA on the number of detected changes was performed by participants (*F1*) and by materials (*F2*) for both languages. Regarding English, the means of detection of word changes under high load condition were not significantly different from the means of detection of word changes under low load condition as *F1* (1, 22) = 1.905, *p* > .05 and *F2* (1, 23) = 3.538, *p* > .05 (see Appendix C, Tables 1 and 2). Concerning Tunisian Arabic, there was not a significant difference in means between high load condition and low load condition as *F1* (1, 22) = 1.100, *p* > .05 and *F2* (1, 23) = .657, *p* > .05 (see Tables 1 and 2). Thus, this result assumes that syntactic complexity has no effect on detection of word changes in both languages.

**Table 1. The Effect of Syntactic Complexity on Depth of Lexical-Semantic Processing in L1 and L2 Reading: Subject Analysis**

**Tests of Within-Subjects Effects**

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	Df	F	Sig.
Syncomp	Sphericity Assumed	1	<b>1.905</b>	<b>.181</b>	1	<b>1.100</b>	<b>.306</b>
	Greenhouse-Geisser	1.000	<b>1.905</b>	<b>.181</b>	1.000	<b>1.100</b>	<b>.306</b>
	Huynh-Feldt	1.000	<b>1.905</b>	<b>.181</b>	1.000	<b>1.100</b>	<b>.306</b>
	Lower-bound	1.000	<b>1.905</b>	<b>.181</b>	1.000	<b>1.100</b>	<b>.306</b>
Error(syncomp)	Sphericity Assumed	22			22		
	Greenhouse-Geisser	22.000			22.000		
	Huynh-Feldt	22.000			22.000		
	Lower-bound	22.000			22.000		

**Table 2. The Effect of Syntactic Complexity on Depth of Lexical-Semantic Processing in L1 and L2 Reading: Item Analysis**

**Tests of Within-Subjects Effects**

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
Syncomp	Sphericity Assumed	1	3.538	<b>.073</b>	1	.657	<b>.426</b>
	Greenhouse-Geisser	1.000	3.538	<b>.073</b>	1.000	.657	<b>.426</b>
	Huynh-Feldt	1.000	3.538	<b>.073</b>	1.000	.657	<b>.426</b>
	Lower-bound	1.000	3.538	<b>.073</b>	1.000	.657	<b>.426</b>
Error(syncomp)	Sphericity Assumed	23			23		
	Greenhouse-Geisser	23.000			23.000		
	Huynh-Feldt	23.000			23.000		
	Lower-bound	23.000			23.000		

The analyses of variance previously carried out showed there was no effect of semantic relatedness/unrelatedness on the change detection rate in English, with *F1* (1, 22) = 1.520, *p* > .05 and *F2* (1, 23) = 1.501, *p* > .05 (see Tables 3 and 4). Concerning

Tunisian Arabic, although analyses of variance revealed no effect of semantic relatedness/unrelatedness on the number of changes detected in item analysis ( $F_2(1, 23) = 3.038, p > .05$ ), such effect appeared in subject analysis ( $F_1(1, 22) = 5.577, p < .05$ ) where the means difference revealed that changes to semantically distant words were more detected than changes to semantically similar ones (see Tables 3 and 4).

**Table 3. The Effect of Semantic Relatedness/Unrelatedness on Depth of Lexical-Semantic Processing in L1 and L2 Reading (EXP1): Subject Analysis**

**Within-Subjects Effects**

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		Df	F	Sig.	df	F	Sig.
semrel (EXP 1)	Sphericity Assumed	1	<b>1.520</b>	<b>.231</b>	1	<b>5.577</b>	<b>.027</b>
	Greenhouse-Geisser	1.000	<b>1.520</b>	<b>.231</b>	1.000	<b>5.577</b>	<b>.027</b>
	Huynh-Feldt	1.000	<b>1.520</b>	<b>.231</b>	1.000	<b>5.577</b>	<b>.027</b>
	Lower-bound	1.000	<b>1.520</b>	<b>.231</b>	1.000	<b>5.577</b>	<b>.027</b>
Error(semrel)	Sphericity Assumed	22			22		
	Greenhouse-Geisser	22.000			22.000		
	Huynh-Feldt	22.000			22.000		
	Lower-bound	22.000			22.000		

**Table 4. The Effect of Semantic Relatedness/Unrelatedness on Depth of Lexical-Semantic Processing in L1 and L2 Reading (EXP1): Item Analysis**

**Within-Subjects Effects**

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
semrel (EXP 1)	Sphericity Assumed	1	<b>1.501</b>	<b>.233</b>	1	<b>3.038</b>	<b>.095</b>
	Greenhouse-Geisser	1.000	<b>1.501</b>	<b>.233</b>	1.000	<b>3.038</b>	<b>.095</b>
	Huynh-Feldt	1.000	<b>1.501</b>	<b>.233</b>	1.000	<b>3.038</b>	<b>.095</b>
	Lower-bound	1.000	<b>1.501</b>	<b>.233</b>	1.000	<b>3.038</b>	<b>.095</b>
Error(semrel)	Sphericity Assumed	23			23		
	Greenhouse-Geisser	23.000			23.000		
	Huynh-Feldt	23.000			23.000		
	Lower-bound	23.000			23.000		

On the basis of the aforementioned results, the existence of an effect of syntactic complexity on depth of lexical-semantic processing in English and Tunisian Arabic is rejected. Therefore, the present results do not endorse Sanford et al.'s (2005) results. In fact, they may be mainly due to the fact that this result is particular to the Tunisian context, and more precisely to the participants of the present study. Those participants told the researcher that all embedded relative clauses –not only object-extracted relative clauses- inhibit them from concentrating and detecting changes. Moreover, they were more able to detect changes that occur in simple sentences (fillers) rather than the ones that occurred at the level of subject-extracted relative clauses or object-extracted relative clauses. Therefore, subject-extracted relative clauses were not low loaded than object-extracted relative clauses for the participants as these former clauses did not help them detect changes. Ultimately, syntactic complexity may be further investigated but with a different operational definition i.e. through comparing complex sentences (i.e. containing embedded relative clauses) to simple sentences.

Additionally, the present results confirmed the fact that changes are more detected when words are changed to semantically distant words rather than when changed to semantically similar ones. These results are consonant with other studies (e.g. Sanford et al., 2005 and Sanford et al., 2004) which found that depth of lexical-semantic processing is also affected by semantic relatedness/unrelatedness. However, the present results cannot be generalized due to the existence of some inconsistencies. Put differently, the effect of semantic relatedness/unrelatedness on depth of lexical semantic

processing is not significant in Tunisian Arabic in case of item analysis and in English in case of subject analysis. Thus, this result cannot be generalized to all subjects experiencing the same condition and to all items having the same structure. Finally, these results are not in line with Sturt et al. (2004) who argued that semantically similar changes were more detected than semantically distant words when they were in focus. Thus, it can be concluded that load and focus work in a different way.

### **Experiment two**

This experiment aims at exploring the effects of referential complexity and semantic similarity/distance on depth of lexical-semantic processing in L1 and in L2 reading. Referential complexity was manipulated by comparing object-extracted relative clauses introduced by Full NPs (high load) to object-extracted relative clauses introduced by indexical pronouns (low load). Semantic relatedness/unrelatedness was assessed by changing the embedded verb to either a semantically related or a semantically unrelated word (see Appendix B). The locus of the change was at the level of the embedded verb.

### **Method**

#### **Design and Materials**

Experiment 2 was composed of two parts: Part (A) was about the English Language and Part (B) was about Tunisian Arabic. There were 24 experimental items and 48 fillers in the English part and also 24 experimental items and 48 fillers in the Tunisian Arabic part, too. The 24 experimental materials used in this experiment were adapted from Sanford et al. (2005). Each experimental item had a core sentence containing an object-extracted relative clause introduced either by a Full NP (16) or an indexical pronoun (17) and an introductory sentence (see Appendix A, Table 2). Sanford et al. (2005) themselves adopted the core sentences from Gibson & Warren (2002) but added the introductory sentences. The fillers used in this experiment were also adapted from Spivey-Knowlton, Trueswell, and Tanenhaus (1993), Sturt (2003) and Sanford et al.'s (2005) experimental items of experiment one. Concerning the fillers, while 18 items matched the experimental items in structure, the other 30 items had different structures at the level of core sentences such as simple sentences but they had also introductory (18).

(16) Learning a new language is easier if you hear it being spoken. The student who the family had willingly accommodated during the summer was friendly and her English really improved during her stay.

(17) The music scene is usually livelier at the weekend. The singer who you have regularly adored over the years is coming to town for a concert to promote her new record.

(18) A senator and a lawyer were debating on TV about international law. The next day, the news reporter criticized the senator but not the lawyer.

There were four versions of the materials presented in each part in Experiment 2 as the first experiment.

#### **Participants**

They had the same criteria as Experiment 1. They did not include anyone who participated in the piloting phase or in experiment 1.

#### **Procedure**

The procedure was identical to that used in experiment 1 except that students were going to read only two sentences (not three as in experiment 1).

#### **Results and discussion**

It has been hypothesized earlier in this paper that increased referential load decreases detection of word changes in reading in English and in Tunisian Arabic respectively. A 2 (referential load: High load vs. Low load) x 2 (semantic relatedness/unrelatedness: semantically similar vs. semantically distant) Repeated Measure ANOVA on the number of detected changes was applied by participants ( $F_1$ ) and by materials ( $F_2$ ) on the data obtained regarding English and Tunisian Arabic. There were not reliably higher rates of change detection under low load condition compared to high load condition as  $F_1(1, 22) = 1.185, p > .05$  and  $F_2(1, 23) = .806, p > .05$  (see Tables 5 and 6).

Table 5. The Effect of Referential Load on Depth of Lexical-Semantic Processing in L1 and L2 Reading: Subject Analysis

## Tests of Within-Subjects Effects

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
refload	Sphericity Assumed	1	<b>1.185</b>	<b>.288</b>	1	<b>.252</b>	<b>.621</b>
	Greenhouse-Geisser	1.000	<b>1.185</b>	<b>.288</b>	1.000	<b>.252</b>	<b>.621</b>
	Huynh-Feldt	1.000	<b>1.185</b>	<b>.288</b>	1.000	<b>.252</b>	<b>.621</b>
	Lower-bound	1.000	<b>1.185</b>	<b>.288</b>	1.000	<b>.252</b>	<b>.621</b>
Error(refload)	Sphericity Assumed	22			22		
	Greenhouse-Geisser	22.000			22.000		
	Huynh-Feldt	22.000			22.000		
	Lower-bound	22.000			22.000		

Table 6. The Effect of Referential Load on Depth of Lexical-Semantic Processing in L1 and L2 Reading: Item Analysis

## Tests of Within-Subjects Effects

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
refload	Sphericity Assumed	1	<b>.062</b>	<b>.806</b>	1	<b>.138</b>	<b>.714</b>
	Greenhouse-Geisser	1.000	<b>.062</b>	<b>.806</b>	1.000	<b>.138</b>	<b>.714</b>
	Huynh-Feldt	1.000	<b>.062</b>	<b>.806</b>	1.000	<b>.138</b>	<b>.714</b>
	Lower-bound	1.000	<b>.062</b>	<b>.806</b>	1.000	<b>.138</b>	<b>.714</b>
Error(refload)	Sphericity Assumed	23			23		
	Greenhouse-Geisser	23.000			23.000		
	Huynh-Feldt	23.000			23.000		
	Lower-bound	23.000			23.000		

Concerning Tunisian Arabic, the results were similar to those found in English. The means of number of detected changes did not differ significantly enough between high load condition and low load condition to assume that referential load had an effect on detection of word changes in Tunisian Arabic as  $F_1(1, 22) = .252, p > .05$  and  $F_2(1, 23) = .138, p > .05$  (see Tables 5 and 6). Moreover, experiment 2 revealed that detection of word changes increases when words are changed to semantically distant ones in English and in Tunisian Arabic as the analyses of variance showed the existence of such difference and leveled it as significant in order in English and Tunisian Arabic ( $F_1(1, 22) = 5.199, p < .05$ ;  $F_2(1, 23) = 4.965, p < .05$ ; and  $F_1(1, 22) = 7.314, p < .05$ ) (see Tables 7 and 8). However, this difference was not significant in Tunisian Arabic when analysis were carried out by items (see Tables 7 and 8). Thus, while experiment 2 revealed that referential load has no effect on depth of lexical-semantic processing in both languages, it confirmed the effect of semantic relatedness/unrelatedness on depth of lexical-semantic processing in both English and Tunisian Arabic.

Table 7. The Effect of Semantic Relatedness/Unrelatedness on Depth of Lexical-Semantic Processing in L1 and L2 Reading (EXP 2): Subject Analysis

Within-Subjects Effects

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
emrel (EXP 2)	Sphericity Assumed	1	5.199	.033	1	7.314	.013
	Greenhouse-Geisser	1.000	5.199	.033	1.000	7.314	.013
	Huynh-Feldt	1.000	5.199	.033	1.000	7.314	.013
	Lower-bound	1.000	5.199	.033	1.000	7.314	.013
Error(semrel)	Sphericity Assumed	22			22		
	Greenhouse-Geisser	22.000			22.000		
	Huynh-Feldt	22.000			22.000		
	Lower-bound	22.000			22.000		

Those results also do neither consolidate Sanford et al.'s (2004) findings about the effect of referential load on depth of in L1 listening nor Sanford et al.'s (2005) results about the effect of referential load on depth of in L1 reading. However, they do back up the interpretation stated earlier. Put differently, these results enhance the idea that embedded relative clauses were the problem for the participants of the present study since they did not detect more changes in case of indexical pronouns than in case of Full NPs. Ultimately, one can conclude that the difficulty caused by embedded relative clauses is not considerably attenuated when introduced by indexical pronouns.

As far as semantic relatedness/unrelatedness is concerned, these results are consonant with other studies (e.g. Sanford et al., 2005 and Sanford et al., 2004) which found that depth of lexical-semantic processing is also affected by semantic relatedness/unrelatedness. However, the present results cannot be generalized due to the existence of some inconsistencies. Put differently, the effect of semantic relatedness/unrelatedness on depth of lexical semantic processing is not significant in Tunisian Arabic in case of item analysis and in English in case of subject analysis. Thus, this result cannot be generalized to all subjects experiencing the same condition and to all items having the same structure. Finally, these results are not in line with Sturt et al. (2004) who argued that semantically similar changes were more detected than semantically distant words when they were in focus. Thus, it can be concluded that load and focus work in a different way.

Experiment three

This experiment aims at checking whether the load effect is localized or whether it is spread due simply to a more general difficulty associated with the high referential complexity sentences. The materials were essentially the same as those used in Experiment two, except that the locus of the change was at the level of the adverb phrase and not at the level of the embedded verb (see Appendix A, Table 3).

Method

Participants

They had the same criteria as those in Experiment 1 and 2. They did not include anyone who participated in the piloting phase or in experiment 1 or 2.

Procedure

The procedure was identical to that used in experiment 1 except that students were going to read only two sentences (not three as experiment1).

Results and Discussion

Processing load has been, previously, theorized to occur at a well-specified locus which is the embedded verb position. However, this hypothesis is rejected mainly for two reasons. First, analyses of variance carried out by participants (F1) and by materials (F2) on the data obtained from experiment 3 showed that there were no reliably higher rates of detection at adverb positions under the low load condition (indexical pronouns) than under the high load condition (Full NP) with F1 (1,

22) = .034,  $p > .05$  and  $F_2(1, 23) = .000$ ,  $p > .05$  in English and  $F_1(1, 22) = .407$ ,  $p > .05$  and  $F_2(1, 23) = .031$ ,  $p > .05$  in Tunisian Arabic (see Tables 9 and 10). Second, results of the first questions, stated earlier, assert that there was no reliably higher rates of detection at embedded verb position under the low-loaded condition (subject-extracted relative clause (Experiment one), indexical pronouns (Experiment two)) than under the high-loaded condition (object-extracted relative clauses (Experiment one), Full NP (Experiment two)) in both English and Tunisian Arabic. Therefore, load is neither localized at the embedded verb locus nor at the adverb phrase locus.

**Table 8. The Effect of Referential Load on Depth of Lexical-Semantic Processing in L1 and L2 Reading (EXP3): Subject Analysis**

**Tests of Within-Subjects Effects**

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
Refload (EXP 3)	Sphericity Assumed	1	.034	.855	1	.407	.530
	Greenhouse-Geisser	1.000	.034	.855	1.000	.407	.530
	Huynh-Feldt	1.000	.034	.855	1.000	.407	.530
	Lower-bound	1.000	.034	.855	1.000	.407	.530
Error (Refload Exp 3)	Sphericity Assumed	22			22		
	Greenhouse-Geisser	22.000			22.000		
	Huynh-Feldt	22.000			22.000		
	Lower-bound	22.000			22.000		

**Table 9. The Effect of Referential Load on Depth of Lexical-Semantic Processing in L1 and L2 Reading (EXP3): Item Analysis**

**Tests of Within-Subjects Effects**

Measure: depthlex

Languages		English			Tunisian Arabic		
Source		df	F	Sig.	df	F	Sig.
Refload (EXP 3)	Sphericity Assumed	1	.000	1.000	1	.031	.862
	Greenhouse-Geisser	1.000	.000	1.000	1.000	.031	.862
	Huynh-Feldt	1.000	.000	1.000	1.000	.031	.862
	Lower-bound	1.000	.000	1.000	1.000	.031	.862
Error (Refload Exp 3)	Sphericity Assumed	23			23		
	Greenhouse-Geisser	23.000			23.000		
	Huynh-Feldt	23.000			23.000		
	Lower-bound	23.000			23.000		

The hypothesis, which stated that load is localized at the embedded verb position, is refuted, which contrasts with Sanford et al.'s (2004) and Sanford et al.'s (2005) studies. Still, their results partially agree with the current results since all of them found that processing load is not situated at adverb positions. But, Sanford et al. (2004) and Sanford et al. (2005) found that load is situated at the embedded verb position as they found a particular effect of sentential load at that position, which is in a sharp contrast with the results of the present study. Consequently, load is neither situated at the embedded verbs nor situated at the adverb positions.

The present paper was also about the effect of sex on depth of lexical-semantic processing in both languages. In fact, female students were suggested to process lexical-semantics more deeply than their male counterparts do in both English and Tunisian Arabic. Analyses of variance were performed for both languages and for with sex as a between-subject factor. These analyses, performed on the three experiments, showed that the mean differences between males and females were not significant enough to assume that females are better processors of lexical-semantics than males (see Table 11).

Table 10. The Effect of Sex on Depth of Lexical-Semantic Processing in L1 and L2 Reading

Tests of Between-Subjects Effects

Measure: depthlex

	English				Tunisian Arabic			
	Source	df	F	Sig.	Source	df	F	Sig.
EXP 1	Intercept	1	93,278	,000	Intercept	1	113,841	,000
	SEX	1	2,069	,164	SEX	1	,359	,555
	Error	22			Error	22		
EXP 2	Intercept	1	105,960	,000	Intercept	1	131,133	,000
	SEX	1	,168	,686	SEX	1	3,319	,082
	Error	22			Error	22		
EXP 3	Intercept	1	79,926	,000	Intercept	1	118,047	,000
	SEX	1	1,778	,196	SEX	1	4,704	,061
	Error	22			Error	22		

This result does not confirm the hypothesis that females process lexical-semantics more deeply than males do in both English and Tunisian Arabic. Additionally, it is counter to Wang et al.'s (2011) finding which revealed that females are better performers in cognitive tasks. The present result may be due to the fact that the size of males was smaller than the size of females or to the fact that depth of processing is not related to sex. Instead, it can be related to other factors such as the students' levels of attention devoted to the task at hand and the students' memory capacity. In fact, the researcher noticed that some female students were less attentive than their male counterparts and that some male students were more careful and concentrating than their female counterparts. Thus, this issue should be more explored in further research ensuring equal sizes of female and male students.

6 GENERAL DISCUSSIONS

Table 12 showed that there is a difference between the number of existing changes and the number of detected changes. More precisely, the number of detected changes is inferior to the number of existing changes. This observation enhances the claim stated earlier that there is an effect of complexity load on depth of lexical-semantic processing in L1 and L2 reading. But, this complexity load is not similar to that previously operationally defined in the present study.

Table 11. Number of Detected Changes vs. Number of Existing Changes

Experiments	Number of detected changes		Number of existing changes per language
	English	Tunisian Arabic	
Experiment one	104	106	192
Experiment two	109	112	192
Experiment three	107	112	192

It is rather hypothesized that syntactic complexity is caused by embedded relative clauses in general and not just object-extracted relative clauses. However, this claim remains a theoretical one and future investigations can be conducted either to prove it or refute it. Therefore, it can be concluded that the present results are in line with Capacity Theory of comprehension. According to this theory, complex syntactic structures (e.g. complex sentences) consume memory resources and limit considerably memory resources spent on semantic analysis (Just & Carpenter, 1992). This "well-compromised" memory resources lead to shallow processing of the semantics of words and consequently to a failure of change detection (Sanford et al., 2005).

The present results refute the claim that shallow processing is a characteristic of L2 processing. They support some studies about shallow processing such as Ferreira et al. (2002), Sanford et al. (2005), and Wang et al. (2011) which found that shallow processing exists in L1, too. Table 12 (Appendix C) suggested that the participants opt for shallow processing in some occasions in both their L1 and L2 languages. Therefore, shallow processing can be considered as a universal characteristic of language processing regardless of one's proficiency in that language.

This paper cannot decide whether there is a relationship between load and semantic relatedness/unrelatedness or not since load as it has been operationally defined in this study proves to have no effect on depth of lexical-semantic processing. Thus, it cannot fully decide whether these results are in line with Granularity Theory of focus. Nevertheless, it reveals that there is an effect of semantic distance on depth of lexical-semantic processing as changes to semantically distant words were more detected than changes to semantically similar words, which contradicts with one basic premise of the Granularity Theory of Focus. This premise declares that critical words whether in focus or in loaded positions when changed to semantically similar words are more detected than when changed to semantically distant words (Sanford et al., 2005). Thus, it can be concluded that the current results partially disapprove with one of the main assumptions of the Granularity Theory Hypothesis.

The hypotheses tested and the procedure followed cannot fully decide if the present results are in line with Good Enough Theory. This theory asserts that people usually are satisfied with the minimum processing that meets their needs; therefore, people are inclined naturally to shallow processing (Ferreira et al., 2002). Deep processing; consequently, occurs occasionally when the task at hand requires more attention. While conducting this study, the participants did affirm that they get the gist of the piece of discourse they read; however, this observation alone still not enough to ensure that the present results consolidate this theory or not. Thus, this issue should be further empirically investigated.

Finally, the analysis the participants' data reveals the presence of many false positives among the participants' answers. In experiment 1, there were 90 false positives in English and 45 in Tunisian Arabic. Only 11 out of 90 occurred at the level of embedded verbs in English and only 5 of them occurred at the level of embedded verbs in Tunisian Arabic. In Experiment 2, there were 72 false positives, 12 of them were at the embedded verb positions in English. In Tunisian Arabic, only four out of 31 were at the embedded verbs positions. The third experiment shows that only six out of 78 and only one out of 52 false positives fell at the adverb position in English and in Tunisian Arabic respectively. These observations demonstrate that the participants failed to detect the loci of changes (embedded verbs in experiments 1 and 2 and adverbs in experiment 3). Consequently, their responses were not due to their recognition of the loci of changes, which increases the reliability of the results obtained.

## 7 MAJOR CONTRIBUTIONS

The present paper has a number of contributions on different domains. First, it can be insightful for computational linguistics since computational linguists argue that complex sentences, mainly those containing embedded relative clauses, hinder the quality of machine translation (Poornima, Dhanalakshmi, Anand, & Soma, 2011). Therefore, they resort to developing simplification programs to obtain two simple sentences out of the complex one. The present study empirically backed up the aforementioned claim since it found that embedded relative clauses hinder depth of processing of meanings of words i.e. the central units of messages. Hence, it is recommended that translators simplify by themselves texts containing such structures before entering them into translation softwares to guarantee an effective translation without changing the meaning.

Moreover, the importance of this study lies in the insights it can provide into the process of teaching reading for both L2 beginners and L2 advanced learners. In the light of the present findings, L2 instructors should avoid texts loaded with embedded relative clauses when teaching L2 beginners because such structures disrupt their reading fluency and hinder their deep processing in reading. Besides, if such structures do exist in texts, teachers should avoid asking those beginners to find synonyms of words found within embedded clauses. Instead, teachers can ask about antonyms since the present results affirm that semantically distant words trigger deep processing more than semantically close words do in the presence of embedded relative clauses. Finally, when those beginners gain reading competency and become somehow advanced readers, it is recommended that their teachers raise their awareness to the effect embedded relative clauses have on their deep processing of reading that they can pay more attention on their processing of words' meanings while facing such structures.

Finally, this paper contributed to the domain of discourse processing not only through investigating the most researched language which is English, but also through exploring an under-researched language which is Tunisian Arabic. In fact, it pioneered in "documenting Tunisian Arabic" as far as research on depth of lexical-semantic processing is concerned. It is recommended that researchers on language processing in the Tunisian context be inspired by this study and dig into their own language to get a better understanding of how it is processed syntactically and semantically speaking. Finally, Tunisian writers or corpus linguists should also be encouraged to write Tunisian Arabic corpuses to facilitate the work of researchers on language processing by providing them with authentic database.

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**MARWA MEKNI TOUJANI** is an EFL teacher at Özel Yildirim İlköğretim Okulu, Turhal, Turkey. In 2013, she taught Commercial English at the Higher Institute of Applied Languages and Computer Sciences, Beja, Tunisia. In 2012, she had got her Master degree in Applied Linguistics from the Higher Institute of Languages, Tunis, Tunisia. She had got her Bachelor degree in Linguistics from the Higher Institute of Languages, Tunis, Tunisia.

APPENDIXES

APPENDIX A

Table 1

Experimental items for Experiment one

The high load version of each material appears first, followed by the second sentence which carries the low load condition, and then how the word changed from the original to the close and distant related words.

The English Version	The Tunisian Arabic Version
<p>1. The man was selected from the identity parade by the witness. The burglar who the police <b>negotiated</b> with had frightened the dog. The dog involved was a Jack Russell and unharmed.</p> <p>The burglar who <b>negotiated</b> with the police had frightened the dog.</p> <p><b>Change:</b> negotiated → bargained/ disagreed</p>	<p>1. الرّاجل طلّعه من بين المشتبه فيهم بفضل الشاهد.</p> <p>السّارق اللّي البوليس <b>تفاوض</b> معاه خوّف الكلب. الكلب من نوع جاك روسال و ما صارلو شي.</p> <p>السّارق اللّي <b>تفاوض</b> مع البوليس خوّف الكلب.</p> <p><b>Change :</b> تفاوض → تساوّم /تفاهمش</p>
<p>2. The workman had all worked together on previous projects. The carpenter who the plumber <b>hit</b> yelled at the painter. Usually, they were a good team but this time it seemed to be going badly.</p> <p>The carpenter who <b>hit</b> the plumber yelled at the painter .</p> <p><b>Change:</b> hit → struck/hired</p>	<p>2. الخدّامة الكلّ خدموا مع بعضهم في مشاريع أخرى قبل. النجار اللّي البلومي ضربو صاح على الدهّان.</p> <p>في العادة كانوا عاملين إيكيب باهية أما المرّة هادي اللأ مور مامشانتش بلقدا.</p> <p>النجار اللّي <b>ضرب</b> البلومي صاح على الدهّان.</p> <p><b>change:</b> ضربو → خدّمو / تتعارك معاه</p>
<p>3. A well-run company is founded on a happy work force. The accountant who the engineer <b>advised</b> spoke to the secretary. All the employees were respected for their knowledge and skill.</p> <p>The accountant who <b>advised</b> the engineer spoke to the secretary</p> <p><b>Change:</b> advised → instructed/ disliked</p>	<p>3. أساس أيّ شريكة ناجحة فروب متاع موظّفين متفاهمين. المحاسب اللّي المهندس <b>نصحو</b> كلّم السّكرتيرة. الموظّفين لكلّ محترمين على خاطر معرفتهم و إتقانهم لخدمتهم.</p> <p>المحاسب اللّي <b>نصحو</b> المهندس كلّم السّكرتيرة.</p> <p><b>Change :</b> نصحو → ما حبّوش/علّمو</p>
<p>4. Good research is conducted in an environment encouraging inquiry and scholarly application. The student who the professor <b>trusted</b> met with the head of the administration. Learning advances through good teamwork.</p> <p><b>Change:</b> trusted → believed/ ignored</p>	<p>4. البحث العلمي باش ينجح لازم يتعمل في محيط يشجّع على البحث و التّطبيق العلمي. الطّالب اللّي البروفسور <b>وثق</b> فيه قابل المسؤول في الإدارة. التّعليم يتحسن كيف بيّدا فمّا فروب متاع خدمة باهي.</p> <p>الطّالب اللّي <b>وثق</b> في البروفسور قابل المسؤول في الإدارة.</p> <p><b>Change:</b> وثق فيه: حقرو/صدّقو →</p>

<p>5. Criminal organizations have been the subject of many popular films and TV programs. The mobster who the media <b>criticized</b> kidnapped the spy. The relationship of the Mafia with government agencies has often been a compelling theme.</p> <p>The mobster who <b>criticized</b> the media kidnapped the spy</p> <p><b>Change: criticized → attacked/admired</b></p>	<p>5. المؤسسات الإجرامية ولأت موضوع برشا أفلام مشهورة و برامج تلفزيونية. المجرم اللّي وسائل الإعلام إنتقدتو خطف الجاسوس. العلاقة بين المافيا و مؤسسات الدولة ولأ موضوع يشد الإنتباه</p> <p>المجرم اللّي إنتقدت وسائل الإعلام خطف الجاسوس.</p> <p><b>Change: إنتقدتو → عجبها/هاجمتو</b></p>
<p>6. Film stars are under intense pressure to produce international hits. The actress who the starlet <b>angered</b> disregarded the leading man. The atmosphere on set can often be unstable.</p> <p>The actress who <b>angered</b> the starlet disregarded the leading man.</p> <p><b>Change: angered: annoyed → appeased</b></p>	<p>6. نجوم الأفلام ديما يعيشوا تحت الضغط باش يطأعوا إنتاجات عالمية ناجحة. الممثلة اللّي النجمة الصغيرة غششتها حقرت البطل. الأجواء في البلاتو ساعات تولي متقلبة.</p> <p>الممثلة اللّي غششت النجمة الصغيرة حقرت البطل.</p> <p><b>Change: غششتها → رضاتها/قلقتها</b></p>
<p>7. There are strict rules about the correct form of behavior at a royal court. The suitors who the king <b>entertained</b> wanted to see the princess. Many people seek professional guidance before they appear at a royal event.</p> <p>The suitors who <b>entertained</b> the king wanted to see the princess.</p> <p><b>Change: entertained → amused/despised</b></p>	<p>7. فمّا قواعد سترىكت تنظم تصرفات العباد في القصور الملكية. الخطاب اللّي الملك فردهم حبوا يشوفوا الأميرة. برشا عباد يلوجوا على توجيهات بروفسيونال قبل ما يمشيوا للقصور الملكية.</p> <p>الخطاب اللّي فردهو الملك حبوا يشوفوا الأميرة.</p> <p><b>Change: فردهم → حقرهم /عمللهم جو</b></p>
<p>8. Finding a suitable marriage partner is taken very seriously by many people. The bachelor who the socialite liked the millionaire. Rich people are often viewed as more attractive.</p> <p>The bachelor who the socialite <b>pursued</b> liked the millionaire</p> <p><b>Change: pursued → chased/rejected</b></p>	<p>8. إنو الواحد بلقا شريك حياتو المناسب موضوع باخذه برشا عباد بجديّة كبيرة. العازب اللّي المرا الغنيّة تتبع فيه يحب لمليونار. الناس الغنية بيداو العباد يلوجوا علاهم.</p> <p>العازب اللّي يتبع في المرا الغنيّة يحب لمليونار.</p> <p><b>Change: رفضو/يجري وراه → تتبع فيه</b></p>
<p>9. There are many popular quiz shows on TV. The contestant who the judges <b>joked</b> with turned toward the cameraman. Being able to see the reaction of the contestants is very important.</p> <p>The contestant who the judges <b>joked</b> with turned toward the cameraman</p> <p><b>Change: joked → laughed/fought</b></p>	<p>9. فمّا برشا برامج مسابقات مشهورة تتعدى على التلفزة. المتسابق اللّي الحكام فذلکوا معاه دار للمصوّر. مهم برشا إنو الواحد بنجم يشوف الرّيباكسيون متاع المتسابق.</p> <p>المتسابق اللّي فذلک مع الحكام دار للمصوّر.</p> <p><b>Change: فذلکوا → تعاركوا/ضحكوا</b></p>

<p>10. There is an increasing demand for therapists and councilors in many areas of modern life. The child who the psychologist <b>talked</b> to had hurt the woman. It is important that all victims should receive a high standard of emotional support.</p> <p>The child who <b>talked</b> to the psychologist had hurt the woman</p> <p><b>Change: talk → spoke/listened</b></p>	<p>10. ولا فَمَا طلب كبير عالمعالجين و الأخصيين النفسيين في برشا مجالات في الحياة العصرية. الطفل اللّي البسيكولوجي <b>تحدّث معاه</b> جرح المرا. حاجة مهمة إنّو الضحايا الكل يتحصّلوا على مستوى عالي مالدعم النفسي.</p> <p>الطفّل اللّي <b>تحدّث معاه</b> البسيكولوجي جرح المرا.</p> <p><b>Change : سمعو/تكلّم معاه → تحدّث معاه</b></p>
<p>11. In many countries, government officials are directly accountable for their own behavior. The diplomat who the Prime Minister <b>insulted</b> angered the dictator. In other countries, however, leaders have total power and have not such responsibility for their actions.</p> <p>The diplomat who <b>insulted</b> the Prime Minister angered the dictator</p> <p><b>Change: insulted → abused/ praised</b></p>	<p>11. في برشا دول، لازم المسؤولين في الحكومة يحاسبوهم شخصيًا على تصرّفاتهم. الدبلوماسي اللّي الوزير لول <b>سبّو</b> غشش الديكتاتور. فدلّ أخرى، بالعكس، الحكام عندهم الحرية المطلقة و ما يتحمّلوش مسؤولية أفعالهم.</p> <p>الدبلوماسي اللّي <b>سبّ</b> الوزير لول غشش الديكتاتور.</p> <p><b>Change مدحو / عنّفو → سبّو</b></p>
<p>12. Tourism is essential to the economy of many countries. The tourists who the guide <b>walked</b> with waved at the nuns. While sightseeing, holidaymakers are advised to guard their belongings.</p> <p>The tourists who <b>walked</b> with the guide waved at the nuns</p> <p><b>Change: walked → strolled/joked</b></p>	<p>12. السّياحة ضرورية لإقتصاد برشا بلدان. السّياح اللّي <b>الفيد مشى معاهم</b> بيباو عالراهبات. ننصحو الخلايعة باش يردّوا بالهم على حوايجهم وقتلّي يحوسوا في الشارع.</p> <p>السّياح اللّي <b>مشاوا مع</b> الفيد بيباو عالراهبات.</p> <p><b>Change فذلك/حوس → مشى</b></p>
<p>13. There are many cases of extra-terrestrial sightings in quiet rural communities. The farmer who the aliens had <b>communicated</b> with phoned the newspaper. It is the role of free press to report accurate information.</p> <p>The farmer who had <b>communicated</b> with the aliens phoned the newspaper.</p> <p><b>Change: communicated → conversed/Struggled</b></p>	<p>13. فَمَا برشا حالات متاع ناس شافت كائنات فضائية في المناطق الرّيفيّة الهادية. الفلاح اللّي الكائنات الفضائية <b>تكلّم معاه</b> عمل تلفون للجريدة. دور وسائل الإعلام الحرة هو باش تنقل الخبر الصّحيح.</p> <p>الفلاح اللّي <b>تكلّم مع</b> الكائنات الفضائية عمل تلفون للجريدة.</p> <p><b>Change تصارعت/ تحدّثت → تكلّم</b></p>
<p>14. American politicians rarely agree on contentious issues. The official who the governor <b>argued</b> with avoided the mayor. They must represent the views of their voters.</p> <p>The official who the governor <b>argued</b> with avoided the mayor</p> <p><b>Change: argued → quarreled/agreed</b></p>	<p>14. السّياسيين الأمريكيان قليل ما يتفاهموا على الأمور المثيرة للجدل. المسؤول اللّي الوالي <b>تجادل معاه</b> تجنّب العمدة. لازم السّياسيين يمثّلوا أفكار الناخبين متاعهم.</p> <p>المسؤول اللّي <b>تجادل مع</b> الوالي تجنّب العمدة</p> <p><b>Change إتفق/ تعارك → تجادل</b></p>

<p>15. There are many examples of personal disputers amongst rock groups. The guitarist who the band <b>played</b> with rejected the agent. Music can earn successful groups and others a lot of money.</p> <p>The guitarist who <b>played</b> with the band rejected the agent.</p> <p><b>Change: played → performed/argued</b></p>	<p>15. فَمَا برشا أمثلة للخلافات الشخصية وسط فرق روك. القيثاريست التي الفرقة <b>عزفت</b> معاه رفض الموزع. الموسيقى تنجم تريح برشا فلوس للفرق الناجحة و لبرشا ناس آخرين زادة.</p> <p>القيثاريست التي <b>عزف</b> مع الفرقة رفض الموزع.</p> <p><b>Change: عزفت → أدات/تعاركت</b></p>
<p>16. The quality of National Health Service care is a major electoral issue. The medical student who the doctor <b>worked</b> with scolded the patient. The government, public and media all closely scrutinize the effectiveness of hospitals</p> <p>The medical student who <b>worked</b> with the doctor scolded the patient.</p> <p><b>Change: Worked → operated/trained</b></p>	<p>16. موضوع جودة الخدمات في الصحة العمومية مهم برشا في البرامج الانتخابية. طالب الطب التي الطبيب <b>خدم</b> معاه صاح على المريض. الحكومة، الناس، و وسائل الإعلام كلهم يراقبوا عن قرب الجودة في السببطارات.</p> <p>طالب الطب التي <b>خدم</b> مع الطبيب صاح على المريض.</p> <p><b>Change : خدم → عمل العمليّة/درّبوا</b></p>
<p>17. Pet animals should always be kept on a leash when walking in the countryside. The dog which the cat <b>chased</b> scratched the baby cats. This is especially important when they are not well trained.</p> <p>The dog which <b>chased</b> the cat scratched the baby cats.</p> <p><b>Change: chased → hunted/annoyed</b></p>	<p>17. الحيوانات الأليفة لازم تتربط كيف بيذا الواحد يحوس في الريف. الكلب التي القطوسة <b>جرات</b> وراه خبش القطاطس الصغار. الحاجة هادي مهمة خاصة كيف بيذاو ماهمش مرين بلقدا.</p> <p>الكلب التي <b>جرى</b> وراء القطوسة خبش القطاطس الصغار.</p> <p><b>Change : جرات وراه → قلقت/حسرت</b></p>
<p>18. Forest animals have come under increasing protection from new legislation. The rabbit which the fox bit ran from the wolf. However, there is little protection for normal species behavior.</p> <p>The fox which <b>bit</b> the rabbit ran from the wolf.</p> <p><b>Change: bit → nipped/sniffed</b></p>	<p>18. فم قوانين جديدة تعطي أكثر حماية لحيوانات الغابة. الأرنب التي الثعلب عضها هربت مالديب. تبقى فما شوية حماية لتصرفات الطبيعية متاع الحيوانات.</p> <p>الأرنب التي <b>عضت</b> الثعلب هربت مالديب.</p> <p><b>Change : عضن → شمو/قرصن</b></p>
<p>19. The media play an important role in monitoring political activity. The reporter who the senator <b>attacked</b> questioned the president. In a powerful country like America the government needs to be closely scrutinized.</p> <p>The reporter who <b>attacked</b> the senator questioned the president.</p> <p><b>Change: attacked → assaulted/protected</b></p>	<p>19. وسائل الإعلام تلعب دور كبير في مراقبة النشاط السياسي. الصحافي التي عضو مجلس النواب <b>هاجمو</b> سنل الرئيس. في دولة قوية كيما أمريكا، الحكومة لازم ديما تتراقب بدقة.</p> <p>الصحافي التي <b>هاجم</b> عضو مجلس النواب سنل الرئيس.</p> <p><b>Change : حماه/هاجمو → ضربو</b></p>

<p>20. Several international companies have been devastated due to heavy financial losses. The banker who the chairman <b>suspected</b> fired the broker. Nick Leason's trading brought about the collapse of Bearings bank.</p> <p>The banker who <b>suspected</b> the chairman fired the broker.</p> <p>Change: <b>suspected</b> → <b>distrusted/praised</b></p>	<p>20. عدد كبير مششركات العالمية تدمرت بسبب الخسائر المالية الكبيرة. البنكاجي اللي رئيس مجلس الإدارة شك فيه طرد السمسار.</p> <p>تصرفات NICK LEASON</p> <p>في البورصة كانت السبب في فلسان بنك ال Bearings.</p> <p>البنكاجي اللي شك في رئيس مجلس الإدارة طرد السمسار.</p> <p>Change: شك فيه → شك فيه: شكر/ ما يثق فيه</p>
<p>21. Nannies often provide high quality care for young infants and children. The babysitter who the parents <b>phoned</b> cooked a meal for the child. Nannies often spend a significant amount of time with the infant.</p> <p>The babysitter who <b>phoned</b> the parents cooked a meal for the child.</p> <p>Change: <b>phoned</b> → <b>called/insulted</b></p>	<p>21. المرؤضات يتلهاو بلتبيبات و بالصغار بلقدا. المرؤضة اللي الوالدين عملوها تلفون حضرت فطور للطفل. المرؤضات ساعات يعديو برشا وقت مع الصغار.</p> <p>المرؤضة اللي عملت تلفون للوالدين حضرت فطور للطفل.</p> <p>Change : عملت تلفون → سبواها /كلموها</p>
<p>22. The standards in many retail outlets have greatly increased over the years. The shop assistant who the manager <b>suspected</b> helped the customer. Many stores spend a lot of money ensuring the environment is comfortable.</p> <p>Change: <b>suspected</b> → <b>distrusted/trusted.</b></p>	<p>22. جودة المعاملات في برشا بوتيكات ماشيا و تتحسن السنين هاذوما. البياعة اللي مولى البوتيك شك فيها عاونت الكليونت. برشا حوانت تصرف في برشا فلوس باش تحسن الجو في داخلها.</p> <p>البياعة اللي شككت في مولى البوتيك عاونت الكليونت.</p> <p>Change : ياتق فيها /ما يا تقش فيها → شك فيها</p>
<p>23. Classical music is a popular form of entertainment. The violinist who the sponsors <b>publicized</b> respected the singer. Talented performers are often highly paid for their skill.</p> <p>The violinist who <b>publicized</b> the sponsors respected the singer.</p> <p>Change: <b>publicized</b> → <b>advertized/criticized</b></p>	<p>23. الموسيقى الكلاسيكية شكل مشهور من أشكال الترفيه. عازف الكمنجة اللي الممولين قدموه لجمهور إحترم المغني. الفنانين الموهبين يخلصوا بلقدا على خاطر موهبتهم.</p> <p>عازف الكمنجة اللي الممولين قدموه لجمهور إحترم المغني</p> <p>Change: إنتقدوه /شهوره → قدموه لجمهور</p>
<p>24. The lives of the rich and famous hold a fascination for many of us. The model who the artist <b>mimicked</b> was questioned by the reporter. Glamorous and beautiful people are idolized by many.</p> <p>Change: <b>mimicked</b> → <b>imitated/disliked</b></p>	<p>24. عيشة الناس الغنية و المشهورين تجلب برشا عباد. العارضة اللي الفنان قلداها سألها الصحافي. برشا عباد تموت على الناس المشهورين و المزيانين.</p> <p>العارضة اللي قلدت الفنان سألها الصحافي</p> <p>Change: كررها/ تصرف كيفها → قلد</p>

Table 2

Experimental items for Experiment Two

The high load version of each material appears first, followed by the second sentence which carries the low load condition, and then how the word changed from the original to the close and distant related words.

The English Version	The Tunisian Arabic Version
<p>1. The college frequently held social functions for visiting academics. The professor who the student <b>had</b> recently <b>met</b> at the party was famous, but no one could figure out why.</p> <p>The professor who I <b>had</b> recently <b>met</b> at the party was famous, but no one could figure out why.</p> <p><b>Change: met → seen/missed</b></p>	<p>1. الجامعة ديمّا تنظّم في حفلات إجتماعيّة للأستاذة الجامعيّين الضّيفاء. البروفسور الّلي الطّالب مازال كيف قابلو مشهور، أما ما فمّا حدّ يعرف علاش.</p> <p>البروفسور الّلي أنا مازالت كيف قابلتو مشهور، أما ما فمّا حدّ يعرف علاش.</p> <p><b>Change: قابلو → شافو / نساه</b></p>
<p>2. Take-overs of organizations are increasingly common and require careful negotiation. The chairman who the consultant <b>had</b> previously <b>interviewed</b> about the company was knowledgeable, but very resistant to changes in the structure of his company.</p> <p>The chairman who I <b>had</b> previously <b>interviewed</b> about the company was knowledgeable, but very resistant to changes in the structure of his company.</p> <p><b>Change: interviewed → questioned/checked</b></p>	<p>2. شريان أسهم الشركات ماشي و يولي شي عادي و لازموا مفاوضات مدروسة. رئيس مجلس الإدارة الّلي المستشار حاورو قبل على الشركة راجل يفهم، أما يعارض برشا أي تغيير في هيكله مؤسستو.</p> <p>رئيس مجلس الإدارة الّلي أنا حاورتو قبل على الشركة راجل يفهم، أما يعارض برشا أي تغيير في هيكله مؤسستو.</p> <p><b>Change: حاورو → حَقّق معاه / سألو</b></p>
<p>3. Learning a new language is easier if you hear it being spoken. The student who the family <b>had</b> willingly <b>accommodated</b> during the summer was friendly and her English really improved during her stay.</p> <p>The student who you <b>had</b> willingly <b>accommodated</b> during the summer was friendly and her English really improved during her stay.</p> <p><b>Change: accommodated → hosted/employed</b></p>	<p>3. الواحد باش يتعلّم لغة جديدة بسهولة لازم يسمعها تتحكى. الطّالبة الّلي العايلة سكنتها عندها بكيفها في الصّيف كانت بحبوحة و الأنقليزيّة متاعها تحسّنت بلقّدا معاهم.</p> <p>الطّالبة الّلي العايلة سكنتها عندها بكيفها في الصّيف كانت بحبوحة و الأنقليزيّة متاعها تحسّنت بلقّدا معاهم.</p> <p><b>Change: سكنتها → خدّمتها/ضيفتها</b></p>
<p>4. It is rare to find people who are really good at motivating others to learn. The teacher who the child <b>had</b> really <b>admired</b> after the lesson was talented, because she could explain very technical ideas in a simple way.</p> <p>The teacher who I <b>had</b> really <b>admired</b> after the lesson was talented, because she could explain very technical ideas in a simple way.</p> <p><b>Change: admired → respected/astonished</b></p>	<p>4. قليل باش تلقى عباد يعرفوا بلحق كيفاش يشجّعوا الناس باش يتعلّموا. الأستاذة الّلي الطّلفة بلحق حببتها بعد الدّرس موهوبة، خاطر تنجّم تفسّر الأفكار التّقنيّة بسهولة.</p> <p>الأستاذة الّلي أنا بلحق حببتها بعد الدّرس موهوبة، خاطر تنجّم تفسّر الأفكار التّقنيّة بسهولة.</p> <p><b>Change: حببتها → استغربت منها / احترمته</b></p>

<p>5. Not considering other people and vehicles when playing in the road can be dangerous. The policeman who the bicyclist <b>had disobeyed</b> on the street was friendly and only issued a warning instead of a fine.</p> <p>The policeman who I <b>had disobeyed</b> on the street was friendly and only issued a warning instead of a fine.</p> <p><b>Change: disobeyed → disregarded/ignored</b></p>	<p>5. تتجَم تكون حاجة خطيرة كيف الواحد ما يعيرش الناس لوخرين و الكراهب وقتلي يلعب في الطريق. البوليس اللي الزاجل على البيسيكلات ما سمعش كلامو في الطريق كان ناس ملاح و نبه عليه أكهوفي عوض ما يعطيه مخالفة.</p> <p>البوليس اللي أنا ما سمعش كلامو في الطريق كان ناس ملاح و نبه علي أكهوفي عوض ما يعطيني مخالفة.</p> <p><b>Change: حفر/ تجاهلو → ما سمعش كلامو</b></p>
<p>6. The quality of teaching at the college was legendary. The advisor who the students <b>have</b> always <b>appreciated</b> for her clear thinking is excited because she recently won a teaching award.</p> <p>The advisor who you <b>have</b> always <b>appreciated</b> for her clear thinking is excited because she recently won a teaching award.</p> <p><b>Change: appreciated → respected/disliked</b></p>	<p>6. الكالتيه متاع التعلیم في الأنستيتو ممتازة. المرشدة اللي الطلبة يقندوها ديما علي خاطر أفكارها الواضحة فرحانة برشا خاطر مازالت كيف ربحت جايزة التعلیم.</p> <p>المرشدة اللي إنت تقندوها ديما علي خاطر خاطر أفكارها الواضحة فرحانة برشا خاطر مازالت كيف ربحت جايزة التعلیم.</p> <p><b>Change: يكرهها/ يحترمها → يقندوها</b></p>
<p>7. Working for counseling service for children and teenagers can be a very rewarding work. The counselor who the teenager had previously <b>called</b> on the phone was helpful since she really cared about his problems.</p> <p>The counselor who I had previously <b>called</b> on the phone was helpful since she really cared about his problems.</p> <p><b>Change: called → spoken to/shouted at</b></p>	<p>7. خدمة مرشدين لصغار و الشباب تتجَم تكون خدمة مفيدة برشا. المرشدة اللي المراهق كلمها في تلفون قبل كانت متعاونة خاطرها تهتم بالحق بمشاكل الناس.</p> <p>المرشدة اللي أنا كلمتها في تلفون قبل كانت متعاونة خاطرها تهتم بلحق بمشاكل الناس.</p> <p><b>Change: صاح علاها/ حكا معاها → كلمها</b></p>
<p>8. Awareness of risk in medicine is becoming ever more important. The doctor who the patient had always <b>depended upon</b> for his health needs was skilful, but it was a dangerous procedure so everyone was worried.</p> <p>The doctor who you had always <b>depended upon</b> for his health needs was skilful, but it was a dangerous procedure so everyone was worried.</p> <p><b>Change: depended upon → relied upon/called.</b></p>	<p>8. الوعي بالأخطار الطبية ماشي وزيد أهمية.</p> <p>الطبيب اللي المريض يعمل عليه ديما باش يداويه طبيب ممتاز، أما العملية خطيرة على ذلك الناس الكل كانوا متقلقين.</p> <p>الطبيب اللي إنت تعمل عليه ديما باش يداويه طبيب ممتاز، أما العملية خطيرة على ذلك الناس الكل كانوا متقلقين.</p> <p><b>Change: كئمو/ يعتمد عليه → يعمل عليه</b></p>
<p>9. The music scene is usually livelier at the weekend. The singer who the fan <b>has</b> regularly <b>adored</b> over the years is coming to town for a concert to promote her new record.</p> <p>The singer who you <b>has</b> regularly <b>adored</b> over the years is coming to town for a concert to promote her new record</p> <p><b>Change: adored → admired/ignored</b></p>	<p>9. الساحة الفنية ديما تكون حية أكثر في الوبك أند.</p> <p>المغنية اللي المعجب يعشقها ديما عندو سنين باش تجي للمدينة و تعمل حفلة إطلاق ألبومها الجديد.</p> <p>المغنية اللي إنت تعشقها ديما عندو سنين باش تجي للمدينة و تعمل حفلة إطلاق ألبومها الجديد.</p> <p><b>Change: يعشقها / يحبها → يعشقها</b></p>

<p><b>10.</b> Buying clothes in the January sales can be very frustrating. The assistant who the shopper <b>had been irritated</b> by from the beginning was unhelpful and refused to look for a bigger size.</p> <p>The assistant who I <b>had been irritated</b> by from the beginning was unhelpful and refused to look for a bigger size.</p> <p><b>Change: irritated → annoyed/ignored</b></p>	<p><b>10.</b> شريان الحوايج في الصّولّد متاع جانفي ينجم يكون حاجة تنرفز. اللبّاعة اللّي الكليونت تنرفزت منها ملول ماكانتش متعاونة و ما حبّتش تشوفها طاي أكبر.</p> <p>اللبّاعة اللّي أنا تنرفزت منها ملول ماكانتش متعاونة و ما حبّتش تشوفلي طاي أكبر.</p> <p><b>Change: تنرفزت → تحقّرت/ تَقَلّقت</b></p>
<p><b>11.</b> Gangs of youths are frequently a nuisance before and after football matches. The woman who the boy had accidentally <b>pushed</b> got upset and decided to report the incident to the policeman standing nearby.</p> <p>The woman who you had accidentally <b>pushed</b> got upset and decided to report the incident to the policeman standing nearby.</p> <p><b>Change: pushed → knocked/crowded</b></p>	<p><b>11.</b> جمهور الكورة الشّباب يتسبّبوا في المضرة قبل و بعد ماتشوات كورة القدم. المرا اللّي الطفل دزّها مين غير ما يقصد تعشّشت و قرّرت باش تشكي بيه للبوليس الواقف قريب.</p> <p>المرا اللّي إنت دزّيتهّا مين غير ما تقصد تعشّشت و قرّرت باش تشكي بيه للبوليس الواقف قريب.</p> <p><b>Change: دزّها → لصقها/ طيحتها</b></p>
<p><b>12.</b> Managing court cases can be a difficult business. The judge who the lawyer <b>had</b> really <b>respected</b> by the end of the trial was brilliant, but he had difficulty keeping the court in order.</p> <p>The judge who I <b>had</b> really <b>respected</b> by the end of the trial was brilliant, but he had difficulty keeping the court in order.</p> <p><b>Change: respected → trusted/envied</b></p>	<p><b>12.</b> ممكن تكون حاجة صعبية إنو الواحد ينجم يتحكّم في قاعات المحكمة. القاضي اللّي المحامي إحترمو في نهاية الجلسة كان ذكيّ برشا، أما ما نجمش يحافظ على الهدوء وقت الجلسة.</p> <p>القاضي اللّي أنا إحترمتو في نهاية الجلسة كان ذكيّ برشا أما ما نجمش يحافظ على الهدوء وقت الجلسة.</p> <p><b>Change: إحترمو فيه → حسدو/ وثق فيه</b></p>
<p><b>13.</b> There is a lot of money to be made from Art and Literature. The author who the editor <b>had talked to</b> late into the night was young but very talented.</p> <p>The author who I <b>had talked to</b> late into the night was young but very talented.</p> <p><b>Change: talked → chatted to/planned with</b></p>	<p><b>13.</b> الواحد كيف يخدم في دومان الفنّ و الأدب ينجم يربح برشا فلوس. الكاتب اللّي رئيس التحرير تحدّث معاه ممخّر في اللّيل كان صغير أما موهوب برشا</p> <p>الكاتب اللّي رئيس التحرير تحدّث معاه ممخّر في اللّيل كان صغير أما موهوب برشا</p> <p><b>Change: تحدّث → خطّط/ دردش</b></p>
<p><b>14.</b> Much of politics depends upon steady effort. The candidate who the Conservative <b>had</b> consistently <b>helped</b> during the campaign was liberal and wanted to increase welfare.</p> <p>The candidate who I <b>had</b> consistently <b>helped</b> during the campaign was liberal and wanted to increase welfare.</p> <p><b>Change: helped → aided/blocked</b></p>	<p><b>14.</b> دومان السياسة يحبّ مجهود متواصل. المترشّح اللّي واحد من حزب المحافظين <b>عاونو</b> وقت حملتو الإنتخابيّة كان ليبرالي و يحبّ يحسنّ في الخدمة الإجتماعيّة.</p> <p>المترشّح اللّي واحد من أنا <b>عاونتو</b> وقت حملتو الإنتخابيّة كان ليبرالي و يحبّ يحسنّ في الخدمة الإجتماعيّة.</p> <p><b>Change: معاونو/ وقف معاه → عاونو</b></p>

<p>15. It can be difficult to find dependable workmen in a hurry. The plumber who the landlord had already <b>hired</b> for the job was incompetent but there was nothing to do because the contract had already been signed.</p> <p>The plumber who I had already <b>hired</b> for the job was incompetent but there was nothing to do because the contract had already been signed.</p> <p><b>Change: hired → got/suggested</b></p>	<p>15. صعب ساعات إنو الواحد يلقي بزربة صناعية باهين. البلومي اللي مولى الدار <b>خُدّمو</b> موش كومبيتون أما ما ينجم يعملوشي على خاطر الكونترا ما بيناتهم تصحح ديجا.</p> <p>البلومي اللي أنا <b>خُدّمّتو</b> موش كومبيتون أما ما ننجم نعملو شي على خاطر الكونترا ما بيناتهم تصحح ديجا.</p> <p><b>Change: خُدّمو → إقترحو / عطاء الخدمة</b></p>
<p>16. At university, a supportive environment can make all the difference. The new student who the volunteer <b>had</b> willingly <b>tutored</b> on a daily basis was bright, but he had difficulty in concentrating.</p> <p>The new student who I <b>had</b> willingly <b>tutored</b> on a daily basis was bright, but he had difficulty in concentrating.</p> <p><b>Change: tutored → taught/trained</b></p>	<p>16. في الجامعة، المحيط كيف يبدا باهي ينجم يصنع الفرق. الطالب الجديد اللي الطالب المتطوع <b>عطاءه</b> يومياً دروس زائدة بكيفو ذكي أما عندو صعوبة في التركيز.</p> <p>الطالب الجديد اللي أنا <b>عطيّتو</b> يومياً دروس زائدة بكيفي ذكي أما عندو صعوبة في التركيز.</p> <p><b>Change: عطاءه دروس زائدة → دربو/قرّاه</b></p>
<p>17. One could say that people get what they deserve. The comedian who the teenager <b>had</b> really <b>hated</b> during the talent show is staying and will do another show at the club tonight.</p> <p>The comedian who you <b>had</b> really <b>hated</b> during the talent show is staying and will do another show at the club tonight.</p> <p><b>Change: hated → disliked/enjoyed</b></p>	<p>17. الواحد ينجم يقول إنو الناس ياخذو على قدّ قلوبهم الفنّان الكوميدي اللي المراهق بالحق <b>كرهو</b> في برنامج المواهب باش يبقى و باش يعمل عرض آخر في النادي الليلية.</p> <p>الفنّان الكوميدي اللي إنت بلحق <b>كرهتو</b> في برنامج المواهب باش يبقى و باش يعمل عرض آخر في النادي الليلية.</p> <p><b>Change: كرهو → حبّو/ماحبّوش</b></p>
<p>18. Respect for people's property is very important. The landlord who the tenant <b>had</b> previously <b>spoken to</b> at a friend's house is pleased to have someone responsible in the apartment.</p> <p>The landlord who you <b>had</b> previously <b>spoken to</b> at a friend's house is pleased to have someone responsible in the apartment.</p> <p><b>Change: spoken to → talked to/listened to</b></p>	<p>مولات الدار اللي الكاري <b>18</b> مهمّ برشا إنو الواحد يحترم ممتلكات الغير. <b>تكلّم معاها</b> قبل في دارواحد من أصحابهم فرحانة خاطر لقات واحد راسبونسايل في الأبرتمن.</p> <p>مولات الدار اللي إنت <b>تكلّمّت معاها</b> قبل في دارواحد من أصحابكم فرحانة خاطر لقات واحد راسبونسايل في الأبرتمن.</p> <p><b>Change: تكلّم معاها → سمعها/تحدّث معاها</b></p>

<p>19. Growing old generally means an increase in dependency on others. The neighbor who the volunteered girl <b>had</b> regularly <b>brought</b> groceries to at the sheltered housing was old and sick and needed help making her dinner.</p> <p>The neighbor who I <b>had</b> regularly <b>brought</b> groceries to at the sheltered housing was old and sick and needed help making her dinner.</p> <p><b>Change: brought → delivered/sent</b></p>	<p>19. الواحد كل ما يكبر في العمر تزيد حاجتو لناس . الجارة اللي الطفلة المتطوعة <b>تجيبها</b> ديما في قضياتها لدار المسنين مرا كبيرة في العمر و مريضة و تحتاج شكون يعاونها في تحضير عشاها</p> <p>الجارّة اللي أنا <b>نجيبها</b> ديما في قضياتها لدار المسنين مرا كبيرة في العمر و مريضة و تحتاج شكون يعاونها في تحضير عشاها.</p> <p><b>Change: تجيبها → تبعثها/تهزلها</b></p>
<p>20. Sometimes people have a great time when they expect not to. The visitor who the host <b>had</b> belatedly <b>invited</b> to the party was shy but ended up having a fantastic time.</p> <p>The visitor who you <b>had</b> belatedly <b>invited</b> to the party was shy but ended up having a fantastic time.</p> <p><b>Change: invited → asked/driven</b></p>	<p>20. ساعات الناس يعدبو وقت حلو مع إنهم ما يتوقعوش هذا. الضيفة اللي مولات الدار <b>إستدعاتها</b> ممخّر للحفلة كانت حاشمة أما مبعد عملت جو.</p> <p>الضيفة اللي إنت <b>إستدعتيها</b> ممخّر للحفلة كانت حاشمة أما مبعد عملت جو.</p> <p><b>Change: إستدعاتها → جبتها/طلبتها باش تجي</b></p>
<p>21. Getting used to going to nursery school can be difficult. The child who the play leader <b>had</b> repeatedly <b>comforted</b> in the playground eventually settled down and played in the sandy playground.</p> <p>The child who I <b>had</b> repeatedly <b>comforted</b> in the playground eventually settled down and played in the sandy playground.</p> <p><b>Change: comforted → calmed/disregarded</b></p>	<p>21. ساعات الصغار يتعودوا على المشيان لروضة بالسيف. الطفل اللي المروضة ديما <b>ترضّي</b> فيه في الكور ركح في لخر و مشا يلعب في الملعب الرملي.</p> <p>الطفل اللي أنا ديما <b>نرضّي</b> فيه في الكور ركح في لخر و مشا يلعب في الملعب الرملي.</p> <p><b>Change: ترضّي → تحقر/تهذي</b></p>
<p>22. Some people can be very inconsiderate of others. The novice skier who the snowboarder had repeatedly <b>harassed</b> on the nursery slopes was fed up being knocked over and complained to the skiing instructor.</p> <p>The novice skier who you had repeatedly <b>harassed</b> on the nursery slopes was fed up being knocked over and complained to the skiing instructor.</p> <p><b>Change: harassed → bothered/struck</b></p>	<p>22. ساعات، فما ناس ما يعطيوش قيمة لمشاعر العباد. المتزلج الجديد اللي للمتزلج المحترف ديما <b>يضايق</b> فيه في البيسطة الساهلة فد من عمالو و شكا بيه للمدرب.</p> <p>المتزلج الجديد اللي للمتزلج المحترف ديما <b>يضايق</b> فيه في البيسطة الساهلة فد من عمالو و شكا بيه للمدرب.</p> <p><b>Change: يضايق → يضرب/يقلق</b></p>
<p>23. Finding medical staff with experience in complex surgical techniques is difficult. The surgeon who the nurse frequently <b>assisted</b> during difficult operations was difficult to understand, as he had a very heavy foreign accent</p> <p>The surgeon who I frequently <b>assisted</b> during difficult operations was difficult to understand, as he had a very heavy foreign accent</p> <p><b>Change: assisted → helped/talked to</b></p>	<p>23. حاجة صعبية باش تلقى كوادر طبية عندهم خبرة في العمليات الجراحية المعقدة. الجراح اللي الفرملية <b>تساعد</b> فيه ديما في العمليات الصعبة يتفهم بالسيف على خاطر عندو أكسون ماهيش مفهومة.</p> <p>الجراح اللي أنا <b>نساعد</b> فيه ديما في العمليات الصعبة يتفهم بالسيف على خاطر عندو أكسون ماهيش مفهومة</p> <p><b>Change: تساعد → تتحدّث معاه/تعاون</b></p>

<p>24. Musicians frequently use shopping centers as a way of capturing audiences. The guitarist who the pedestrian really <b>liked</b> because he played a lot of modern music was playing music in the shopping mall.</p> <p>The guitarist who you really <b>liked</b> because he played a lot of modern music was playing music in the shopping mall.</p> <p><b>Change: liked → loved/hated</b></p>	<p>24. الفنّانين يستعملو ديما في الفضاءات التجاريّة باش يجلبوا الجمهور. الفيتاريست اللي الرّاجل المتعدّي <b>يحبّو</b> بلحق خاطر يعزف في الموسيقى العصريّة قاعد يعزف في السونتر كومارسيال</p> <p>الفيتاريست اللي إنت <b>تحبّو</b> بلحق خاطر يعزف في الموسيقى العصريّة قاعد يعزف في السونتر كومارسيال</p> <p><b>Change: يحبّو → يعشقو / يكرهو</b></p>
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Table 3

Experiment three

Experimental items in Experiment three are the same as Experiment two, but changes are made to adverb phrases rather than embedded verbs.

The English Version	The Tunisian Arabic version
1. Luckily → fortunately/unfortunately.	من سوء حظّو / من حسن حظّو → بالزّهر
2. Previously → formerly/subsequently.	من بعد / يكرّي → قبل
3. Willingly → happily/unwillingly.	بالسيف/بفرحة → بكيفها
4. Fanatically → obsessively/casually.	نص نص / بهوس → برشا برشا
5. Foolishly → stupidly/wisely.	بذكاء/ببهامة → مين غير ما يختم
6. Always → constantly/rarely.	شويّة/على طول → ديما
7. Tentatively → shyly/boldly.	برقعة / أو أنا حاشم → و أنا متردّد
8. Sensibly → prudently/irrationally.	مين غير ما تختم / أو إنت محطاط → إنت رادّ بالك
9. Thoroughly → totally/mildly.	شويّة/برشا برشا → علّخر
10. Fairly → slightly/extremely.	برشا/موش برشا → شويّة
11. Accidentally → mistakenly/deliberately.	بلعاني / بلغلط → مين غير ما يقصد
12. Really → truly/slightly.	شويّة/بلحق → برشا
13. Regularly → frequently/occasionally.	ساعات/برشا مرّات → ديما
14. Consistently → steadily/infrequently.	شويّة/على طول → باستمرار
15. Cautiously → carefully/rashly.	بزرية / أو هو محطاط → هو رادّ بالو
16. Anxiously → nervously/calmly.	وهو هادي / وهو منرفز → وهو على أعصابو
17. Obviously → clearly/secretly.	مين غير ما يظهر / بوضوح → بشكل واضح
18. Briefly → momentarily/extensively.	برشا / لحظات → شويّة
19. Thoughtfully → considerately/carelessly.	فوق من قلبي / بكيفي → بمحبّة
20. Cheerfully → gladly/reluctantly.	بالسيف / بكلّ فرحة → بمحبّة
21. Repeatedly → repetitively/occasionally.	ساعات/برشا مرّات → ديما
22. Frequently → often/seldom.	موش ديما/برشا مرّات → ديما
23. Eagerly → enthusiastically/unwillingly	فوق من قلبي / بكلّ حماس → بمحبّة
24. Usually → generally/sometimes.	ساعات/ديما → في العادة