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# How Does the Linguistic Distance Between Spoken and Standard Language in Arabic Affect Recall and Recognition Performances During Verbal Memory Examination

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**Abstract** The current research examined how Arabic diglossia affects verbal learning memory. Thirty native Arab college students were tested using auditory verbal memory test that was adapted according to the Rey Auditory Verbal Learning Test and developed in three versions: Pure spoken language version (SL), pure standard language version (SA), and phonologically similar version (PS). The result showed that for immediate free-recall, the performances were better for the SL and the PS conditions compared to the SA one. However, for the parts of delayed recall and recognition, the results did not reveal any significant consistent effect of diglossia. Accordingly, it was suggested that diglossia has a significant effect on the storage and short term memory functions but not on long term memory functions. The results were discussed in light of different approaches in the field of bilingual memory.

**Keywords** Verbal memory · Diglossia · STM · LTM · Recall · Recognition · Learning · Arabic language · Bilingualism

## Literature Review

Bilingual memory has attracted the scientific curiosity of many cognitive scientists (Cameli et al. 2005; Craik 2002; Craik and Lockhart 1972; Fernandes et al. 2007; Francis 1999; Francis and Gutiérrez 2012; French and Jacquet 2004; Glanzer and Duarte 1971; Kormi-Nouri et al. 2008; Pavlenko 2000; Witzel and Forster 2012). Different researchers reported about differences in the quality of recall and recognition of words during performances

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in bilingual memory tests. Such differences were usually attributed to the lexical status of the target words (first language "L1" versus second language "L2") (Cameli et al. 2005; Francis and Gutiérrez 2012). However, different researchers agree that learning L1 words is easier than learning L2 words because of the fact that L1 words are frequently being used during the daily life than L2 words (Gollan et al. 2008). Hence, superiority effects during the performance of memory tasks, such like recall and recognition, were usually reported for L1 compared to L2 words (Durgunoglu and Roediger 1987; Glanzer and Duarte 1971; Nott and Lambert 1968).

In general, the lexical status of L2 versus L1 words has been explained through different models (for further details see: French and Jacquet 2004). These models differ in explaining the lexical status and the quality of the lexical and conceptual links between L1 and L2. The main determine factor that has been reported to affect the quality of the different links between L1 and L2 is the level of L2 proficiency (Chen 1990). Such proficiency factor modulates the lexical and conceptual links between L1 and L2 and has been supposed to affect the performance during memory tasks, like recall and recognition of previously learned words or concepts, depending on the lexical status of the learned word (Cameli et al. 2005; Durgunoglu and Roediger 1987; Francis and Gutiérrez 2012). For example and concerning the case of low proficient L2, the "Words Association Model" (Kroll and Stewart 1994) postulates an existence of direct lexical link between L2 to L1 while the conceptual access to L2 passes through the lexical path of L1 in the way of reaching the conceptual meaning of L2 words (Chen 1990). This model, which has been associated with what is known as "Hierarchical models" approach, explains well the use of low proficiency L2 versus automatic use and retrieval of L1 words (Kroll and Stewart 1994; Kroll et al. 2010). On the other hand, the conceptual mediation and the mixed models approach postulate that for very proficient L2, there is a direct route to the conceptual level (French and Jacquet 2004).

Hence, the lexical status of the words that were used in testing recall, recognition, and verbal learning in general, has been found to affect the performance in such learning tasks (Cameli et al. 2005; Durgunoglu and Roediger 1987; Francis and Gutiérrez 2012).

It can be deduced from the above mentioned review that in memory tasks, the lexical status of the word and the level of automaticity of accessing its conceptual level are the main factors that might affect the quality of the recall and the recognition performances. Accordingly, different researchers reported that in verbal memory tasks, words recall with L1 lexical status was easier and better than the recall of L2 words or of less fluent L1 words (Durgunoglu and Roediger 1987; Glanzer and Duarte 1971). On the other hand, other researchers tend to postulate that differences in recall performances for more and less fluent languages have been explained either by the greater demand that L2 processing puts on cognitive resources or by the lower familiarity of L2 words (Francis and Gutiérrez 2012). For example, words with L2 status need to be processed with highly cognitive demands and relying on intensive cognitive resources (Abu-Rabia 2003). This intensive processing was postulated to affect the processing of L2 words during memory tests performances like recall and lexical access (Hicks and Marsh 2000). The Findings from the study of Francis and Gutiérrez (2012) support this former postulation. Within their study, Francis and Gutiérrez, asked bilingual participants to learn lists of words in English and Spanish under shallow- and deep-encoding conditions. The Overall findings of Francis and Gutiérrez study revealed that the hit rates were higher, discrimination greater, and response times shorter in the non-dominant language, and this was similar to the effects were observed for lower frequency words in the dominant language. According to Francis and Gutiérrez, the results support the idea that memory performance in the non-dominant language is impacted by both the greater demand for cognitive resources and the lower familiarity of the words.

It is important to mention here that the whole body of research about bilingualism and memory in general and memory functions and bilingualism in particular were conducted in two different linguistic contexts, so called L1 and L2, depending on the sequence of the language acquisition. No body of research has examined this issue of memory and bilingualism within the same lingual context were two variants of the same language are used, one for the daily life and the other for written and formal communication as in the case with Arabic language. This situation of having two branches of the language for different uses is known by the term "Diglossia" (Ferguson 1959).

## Diglossia in Arabic

Arabic spoken language (hereafter SL) has different vernaculars which vary from one geographic area to another. The difference between these vernaculars can be expressed on all linguistic domains; phonological, morphological, syntactic and semantic levels (Taha 2013). In any case, all variations of different spoken vernaculars are different from the modern standard Arabic (hereafter SA), which is considered universal literary language for all Arabic speakers. The literary language is characterized by specific grammatical rules, with specific semantic and phonological systems differentiated from all spoken variations. Usually, the first time that native Arab-speaking children are exposed to the written standard Arabic is when they begin to read and write (Taha 2013). Within this situation, and specifically at the point in time of learning about the Arabic alphabetic system and letter-sound correspondences, the children may find themselves exposed to a new linguistic system featured by phonological and syllabic structures which are different from those of their own spoken vernacular linguistic system. This linguistic distance between the written and the spoken language is a classic example of a specific linguistic situation called Diglossia (Ayari 1996; Ferguson 1959), and already found to have an effect on the acquisition of phonological awareness, reading and writing among Arabic-speaking children (Abu-Rabia and Taha 2005; Mannai and Everatt 2005). Given that SL is acquired before the SA acquisition and processed in a more automated manner than the last one, researchers have tended to argue that SA behave like a second language among native Arab speakers (Ibrahim and Aharon-Peretz 2005). It is important to note that the linguistic distance between the SL and the SA leads to the existence of different types of lexical status of words: pure SL words, pure SA, similar but not identical words, and identical words. This distance depends on the degree of the overlap between the phonological structures of the word (pronunciation of the word) in the SL with the one in the SA. For example, pure SL and the SA words are those which refer to the same conceptual meaning but have completely different pronunciation and phonological structure within each linguistic branch of Arabic. For Example the conceptual semantic term "hat" is being referred by the phonological pronunciation "Taqiya" as the word is used within the SL context to refer to the semantic concept "hat", while the word "Kobbaʕah" is the suitable word in the SA context. Beside, other words from the SL and the SA are sharing most of the phonological structure and accordingly are very similar on their pronunciation but each of them fit the syllabic structure of the linguistic context where each word belongs to, accordingly these words are not identical. For example the conceptual semantic term "Screen" is referred by the phonological pronunciation "Shashih" as the word is being used within the SL context, while the word "Shashah" is used within the SA context. The other groups of words are the identical words within the SL and the SA. For example the concept "pen" is referred by the word "Qalam" within the northern Palestinian SL vernacular and within SA as well. It is important to mention that the overlap between the SL and the SA is different

among the different vernaculars of the SL, accordingly we can find that this overlapping is different across the different spoken vernaculars.

Depending on the assumption that diglossia in Arabic represents a situation of bilingualism within the same context of language, it can be assumed that this situation may affect the performance on learning and memory tasks as a function of the distance between the SL and the SA items that being used on such memory tasks. Since words from the SL lexical status are acquired early during the lifespan of the native Arab speakers than SA words, it will be assumed that the SL words have an automatic link to their conceptual meaning compared to the words with SA status only, and will be learned easily during memory learning tasks (Kroll and Stewart 1994).

Concerning the words from the SL that are phonologically similar (Hereafter PS words) to those from the SA, It will be assumed that the exposure to these words leads to conceptual activations in SA also, and accordingly they will be learned faster than words from SA only or SL only during the performance in memory tasks. The assumption here is that the likelihood of the exposure to PS words is higher than for SL or SA words because of the fact of that these words usually used in both linguistic contexts, the SA and the SL. More closely, when using these words in one linguistic context and because of the fact that these words share phonological similarity within the two contexts, this will simultaneously activate the similar phonological structure in the other context, and accordingly this will strength the phonological-conceptual link of the word in both contexts. Accordingly, it can be assumed that for learning and memory tasks these PS words are assumed to be learned and remembered easily than words with SL or SA status only.

In light of the above mentioned review and assumptions, the current study will examine how does the performance on learning memory tasks in Arabic can be modulated by the linguistic status of the words being used for such examination. The testing of this question may help in determining whether linguistic-lexical differences between the SL and the SA in Arabic meet the full bilingualism situation or not.

## Methods

### Participants

Within the current study, thirty native-Arab college students with normal reading and hearing skills were selected for participating in this study. The participants sample includes twenty two females and eight males (age $23.05 \pm 3.12$). All the participants were right handed, native Arabs who speak the north Palestinian vernacular. In light of the fact that the current research is going to investigate how the lexical status of the words affect learning performance, as it going to be measured by memory recognition and recall test, hence, the participants were selected with both typical spoken and written language skills.

### Materials

A memory and learning task was developed according to the Rey Auditory Verbal Learning Test (RAVLT). The RAVLT is a commonly used as clinical, cognitive and educational measure of verbal learning and memory (Strauss et al. 2006; Sullivan and Bowden 1997). The RAVLT provides a measure of verbal memory functions, including immediate memory span, new learning, and recognition memory, and is widely acceptable as a valid measure of verbal learning and memory (Rosenberg et al. 1984). The current task was adaptively designed in

light of the RAVLT test, and was developed in three versions (see "Appendix 1" for the different lists of words): (a) Pure SL version: The test contains 15 words that were presented auditory to each participant during the different stages of the test (as it will be explained in the testing process in the section below). The words within this version exist in the SL vernacular only without any phonological similarity with the parallel SA words that represent the same conceptual meaning. (b) Pure SA language version: The words within this version exist in the SA only without any phonological similarity with the parallel SL words that represent the same conceptual meaning. (c) PS words: This version of the test consists from 15 SL that share large body of the phonological structure with the parallel conceptual words within the SA context (phonologically similar). For each version, the word lexical frequency was rated by 10 raters using a 5 levels scale (1 = very low frequency into 5 = very high frequency). The average for rating the SL frequency was $4.17 \pm .18$, while for the SA and the PS was $4.27 \pm .2$ and $4.3 \pm .19$ respectively. The differences in the word frequency levels between the three versions were not significant [$F(2, 44) = 2.14$, $p = .13$]. The words within the three versions have been adjusted as well in terms of the number of syllables. For the SA version, the average of the number of words' syllables was $2.46 \pm .74$, while for the SA and the PS was $2.33 \pm .81$ and $2.4 \pm .63$ respectively. The differences in the word frequency levels between the three versions were not significant [$F(2, 44) = .12$, $p = .88$].

## Procedure

*Learning trail–free recall* Each participant was tested with the three versions of the learning test (Pure SL, Pure SA, and PS). Each participant was tested with each version in different days. The sequences of the versions administration was changed from participant to another for controlling the order effect. For each version, each participant required to recall the 15-items after hearing them from the examiner immediately and in any order after they were presented. Five trials of the recall task were conducted in which the order of words remains fixed and the instructions were repeated for each trial. The performance of the free recall (the learning induction) was scored by summing the number of words which were correctly recalled across five immediate recall trials.

## Learning Trail–Delayed Recall

This trail was demonstrated 30 min after performing the recall trail. For each list of words, the participant was asked to recall as much as s/he can and in any order. The total score for this part of testing was computed by summing the total numbers of the correct items were recalled.

## Recognition Trail

This trail was demonstrated 40 min after performing the recall trail for each list of words. Each subject was presented verbally by list of words. Each recognition list (one for the SL, one for the SA and one for the PS) contained 40 words. Beside to the 15 original words, 25 distractor words were presented to the subject for each list within this trail (see "Appendix 2" for the different lists of the distractors words). The participant was asked to response by "Yes" if s/he supposed that the heard word was presented within the original learning list or by "No" if s/he supposed that the word was not presented previously. For each linguistic condition of examination, the original and the distractors (false) words were presented with mixed order. It is important to mention here that the distractor items in the recognition list for

each linguist condition were different between the three recognition lists (SL, SA and PS). The distractor items for each list were from the same linguistic status as the real items of the list (i.e. the distractor items of the SL list were also from the SL linguistic status and the same for the other lists). The responses of each participant were encoded into one of four response categories in accordance of the response type as following: (A) *True positives*: When the participant's "yes" response is true. (B) False positives: an error of recognition that describes the situation for "yes" response for items that were not heard in the learning list. (C) True negatives: True "No" response for items that were presented in the recognition list but not in the learning list (distractors). (D) False negative: False "No" response for items that the participant actually heard in the learning list. The testing order of the recognition trail was mixed between the three linguistic conditions.

For adjusting the levels of the lexical frequency between the original items and the distractors within each recognition list, the frequency rating was implemented also for the distractor words in each list. Using the rates of 10 raters reveled that for the distractors in SL version the lexical frequency average was $4.22 \pm .2$, this average did not differ significantly from the frequency average of the original true items [$F(1, 39) = .77$, $p = .38$]. For the distractors from the SA recognition list, the frequency average was $4.16 \pm .29$ and did not differ significantly from the frequency average of the original true items [$F(1, 39) = 1.82$, $p = .18$]. Also the frequency average was computed for the PS distractors and revealed an average of $4.27 \pm .42$, without any significant differences between the average of the frequency rating for the original true items of this list [$F(1, 39) = .32$, $p = .57$]. Beside to the frequency adjustments between the original true items and the distractors, a syllabic adjustment was implemented also for controlling the effect of words' length. The syllabic length average for the distractors from the SL recognition list revealed an average of $2.4 \pm .7$ which did not differ significantly from the average of syllabic length of the original true items [$F(1, 39) = .08$, $p = .78$]. For the SA distractors, the syllabic length average was $1.96 \pm .53$ and did not differ significantly from the syllabic length of the original true items [$F(1, 39) = 3.04$, $p = .09$]. This is also was the case for the PS distractors with syllabic length average of $2.1 \pm .68$ without any significant differences with the syllabic length of the original true items [$F(1, 39) = 1.37$, $p = .25$].

## Results

### Learning Trail–Free Recall

The 3 (linguistic status: SL, SA, and PS) $\times$5(learning trails) ANOVA revealed a significant main effect of the linguistic status [$F(2, 28) = 3.9$, $p = .03$] beside to significant main effect of the learning trail [$F(4, 26) = 148.46$, $p < .001$]. A significant interaction between the linguistic status and the learning trail was found also [$F(8, 22) = 2.89$, $p = .02$].

Separated analysis of variance using repeated measures method was implemented for each learning trail where the linguistic status of the words was used as between conditions factor with its three levels: SL, SA and the PS. For the first learning trail, the results indicated a significant effect of the linguistic status factor [$F(2, 28) = 5.15$, $p = .012$]. Post hoc analysis using "Bonferroni" post hoc test showed a significant differences between the performances in the SL and the SA lists only (mean $= 8.8 \pm 2.02$ and $7.16 \pm 2.5$ respectively). Significant differences were not found between the PS condition (mean $= 7.86 \pm 2.09$) and the other conditions. For the second learning trail, a significant effect of the linguistic status factor

**Table 1** Mean and SDs for each learning trail within each linguistic status

| | N | Mean | SD |
|---|---|---|---|
| SL1 | 30 | 8.80 | 2.02 |
| SL2 | 30 | 11.20 | 1.69 |
| SL3 | 30 | 12.73 | 1.31 |
| SL4 | 30 | 13.33 | .99 |
| SL5 | 30 | 13.97 | .89 |
| SA1 | 30 | 7.17 | 2.52 |
| SA2 | 30 | 9.87 | 2.37 |
| SA3 | 30 | 11.70 | 2.05 |
| SA4 | 30 | 13.30 | 1.68 |
| SA5 | 30 | 13.83 | 1.12 |
| PS1 | 30 | 7.87 | 2.10 |
| PS2 | 30 | 11.33 | 1.30 |
| PS3 | 30 | 12.63 | 1.43 |
| PS4 | 30 | 13.47 | .86 |
| PS5 | 30 | 14.13 | .68 |

The numbers 1–5 represent the learning trail sequence for each linguistic status
*SL* spoken Arabic, *SA* standard Arabic, *PS* phonological similarity

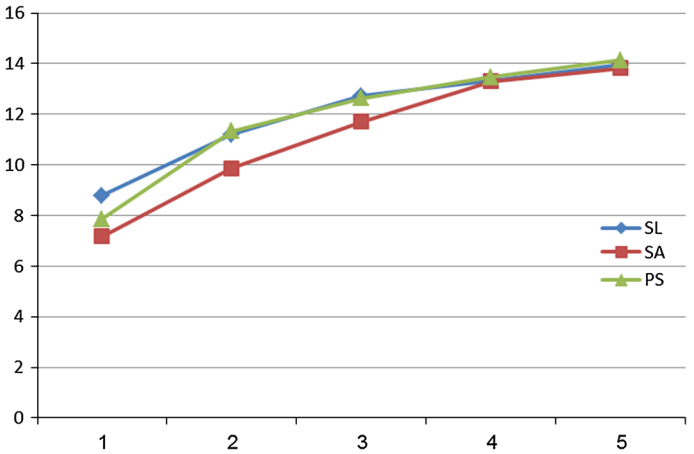


**Fig. 1** The average performance for each trail within each linguistic status. *SL* spoken language, *SA* standard Arabic, *PS* phonological similarity

was found [$F(2, 28) = 6.27$, $p = .006$]. Post hoc analysis using "Bonferroni" post hoc test showed a significant differences between the performances in the SL and the SA lists (mean $= 11.2 \pm .3$ and $9.86 \pm .43$ respectively). A significant differences were found also between the PS condition (mean $= 11.33 \pm 2.3$) and the SA one. Considering the third learning trail, a marginal significant effect of the main factor was found for [$F(2, 28) = 3.11$, $p = .06$] while the post hoc analysis did not revealed any significant differences between the three conditions (see Table 1 for means and SDs). For the fourth and the fifth trails, no significant effects were found with almost similar performances in the different three conditions within these learning trails (see Fig. 1).

**Table 2** Mean and SDs of the word accumulation averages in each learning trail compared to the previous one within each linguistic status

| | N | Mean | SDs |
|---|---|---|---|
| SL1 | 30 | 8.80 | 2.2 |
| SL2 | 30 | 2.40 | 1.71 |
| SL3 | 30 | 1.53 | 1.48 |
| SL4 | 30 | .60 | 1.13 |
| SL5 | 30 | .63 | .89 |
| SA1 | 30 | 7.17 | 2.52 |
| SA2 | 30 | 2.70 | 2.09 |
| SA3 | 30 | 1.83 | 1.97 |
| SA4 | 30 | 1.60 | 1.59 |
| SA5 | 30 | .53 | 1.61 |
| PS1 | 30 | 7.87 | 2.1 |
| PS2 | 30 | 3.47 | 1.76 |
| PS3 | 30 | 1.30 | 1.18 |
| PS4 | 30 | .83 | 1.26 |
| PS5 | 30 | .67 | .80 |

The numbers 1–5 represent the learning trail sequence for each linguistic status
*SL* spoken Arabic, *SA* standard Arabic, *PS* phonological similarity

## Learning Trail–Learning Rate

Learning rate describes the average of the storage accumulation from one trail to the next one. This accumulation is being reflected by the number of the new words that were accumulated in each new retrieval trail compared to the previous one. Accordingly, for each learning condition within each linguistic status (SL, SA, and PS) such learning-rate average was computed as following: $((LS1 - 0) + (LS2 - LS1) + (LS3 - LS2) + (LS4 - LS3) + (LS5 - LS4))/5$. The "LSn" (LS1, LS2, LS3, LS4 and LS5) describes the learning trail order within any linguistic status (Accordingly, "LS" the Linguistic status and the "n" is the order number of the learning trail), while the $(LS(ni) - LS(ni - 1))$ describes the number of the new words that were accumulated in each new retrieval trail compared to the previous one. Hence for the SL condition as an example, the average of the learning rate computation will be described as following: $((SL1-0)+(SL2-SL1)+(SL3-SL2)+(SL4-SL3)+(SL5-SL4))/5$, [SL1 is the first learning trail within this condition (while "0" describes the value of the pre-learning stage of the first trail), SL2 is the second trail within this condition and so on]. Hence, the formula for computing the learning trail for the SA and the phonological similarity conditions would be as following: $((SA1-0)+(SA2-SA1)+(SA3-SA2)+(SA4-SA3)+(SA5-SA4))/5$, and $((PS1 - 0) + (PS2 - PS1) + (PS3 - PS2) + (PS4 - PS3) + (PS5 - PS4))/5$, respectively. Accordingly, the average learning trail for each condition was computed in according to this above mentioned formula (see Table 2).

The repeated measures analysis of variance did not revealed any significant main effect of learning rate [$F(2, 28) = 1.16$, $p = .3$] showing that the learning rate is similar between the different three linguistic conditions. Figure 2 describes the accumulation rate between the trails for each linguistic condition i.e. $(LS2 - LS1)$, $(LS3 - LS2)$, $(LS4 - LS3)$ and $(LS5 - LS4)$.

However, testing the differences between the three linguistic conditions regarding the accumulation number of words for each learning trail revealed a significant effect for the

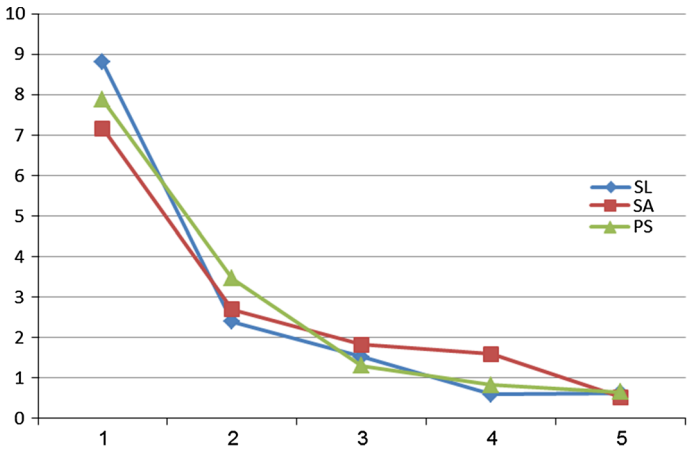


**Fig. 2** The accumulation average between the trails for each learning condition. *SL* spoken language, *SA* standard Arabic, *PS* phonological similarity

**Table 3** The average retrieved words in the delayed recall for each linguistic status

*SL* spoken Arabic, *SA* standard Arabic, *PS* phonological similarity

| | N | Mean | SDs |
|---|---|---|---|
| SL | 30 | 12.20 | 1.47 |
| SA | 30 | 12.20 | 1.94 |
| PS | 30 | 12.67 | .96 |

linguistic status regarding the accumulation effect for the first trail [$F(2, 28) = 5.56$, $p = .012$], while the post hoc analysis showed that the source of such significant main effect is attributed to the significant differences between the performance in the SL (mean $= 8.8 \pm 2.2$) and the SA (mean $= 7.17 \pm 2.52$). Significant difference regarding the accumulation rate was also found for the fourth trail [$F(2, 28) = 4.95$, $p = .014$] whereas the source of the significant difference was found between the SL ($.6 \pm 1.13$) and the SA condition ($1.6 \pm 1.59$).

## Learning Trail–Delayed Recall

The repeated measures analysis of variance did not revealed any significant differences between the three linguistic conditions regarding the delayed recall performances [$F(2, 28) = 1.89$, $p = .16$] (see Table 3).

## Recognition Trail

*Overall accuracy* overall accuracy was computed as a variable that reflects the sum of the true positives and true negatives responses together for each list of each lexical status (see Table 4). The 3 (lexical status: SL, SA, and PS) ANOVA revealed a marginal significant effect of list linguistic status [$F(2, 28) = 3.12$, $p = .06$] while the "Bonferroni" post hoc test showed also a marginal significant effect between the SA (mean $= 39.93 \pm .06$) and the PS (mean $= 39.7 \pm .08$) conditions only.

**Table 4** Scores average for each response category and the overall accuracy for each linguistic status

| | SL (±SDs) | SA (±SDs) | PS (±SDs) |
|---|---|---|---|
| True positives | 14.96 (±.18) | 14.93 (±.36) | 14.96 (±.18) |
| False positives | .1 (±.3) | 00 (±00) | .27 (±.44) |
| True negatives | 24.9 (±3) | 25 (±.44) | 24.73 (±.44) |
| False negatives | .03 (±.18) | .06 (±.36) | .03 (±.18) |
| Overall accuracy | 39.86 (±.34) | 39.93 (±.36) | 39.7 (±.46) |

*SL* spoken Arabic, *SA* standard Arabic, *PS* phonological similarity

Considering the response categories, a separated analysis of variance was conducted for each category while the linguistic status of each list was used as between subject variable (see Fig. 2).

*True positives* the analysis of variance did not revealed any significant main effect off the linguistic status of the items [$F(2, 28) = .1$, $p = .9$].

*False positives* the analysis of variance revealed a significant main effect of the linguistic status of the items [$F(2, 28) = 8.1$, $p < .01$]. Bonferroni post hoc test showed that significant differences were found between the responses for SA list (mean$mean = 00 \pm .00$) and the PS one (mean $= .27 \pm .08$).

*True negatives* the analysis of variance revealed a significant main effect of the linguistic status of the items [$F(2, 28) = 8.1$, $p < .01$]. Bonferroni post hoc test showed that significant differences were found between the responses for SA list (mean $= 25 \pm .00$) and the PS (mean $= 24.73 \pm .08$).

*False negatives* the analysis of variance did not revealed any significant main effect off the linguistic status of the items [$F(2, 28) = .1$, $p = .9$].

In sum and according to the results that were presented we can learn that that for immediate free-recall, the performances were better for the SL and the PS conditions compared to the SA one. However, for the parts of delayed recall and recognition, the results did not reveal any significant consistent effect of diglossia.

## Discussion

The current study tried to explore how the linguistic status of words in Arabic can affect the performance the verbal learning as it is reflected by the quality of the recall and recognition performances. Three versions of the memory learning tests were used, one with pure spoken words (the SL version), the pure standard words (SA version), and the version of the similar words (PS words).

The finding of the current study may shed new light on the nature of diglossia in Arabic and its linguistic impact on the quality of the process of verbal learning. Mixed findings raised from the current study, while there is no doubt that the findings which are related to the part of the immediate recall indicate the superiority of verbal learning context for words that belong to the more available linguistic contexts in terms of use; the SA and PS contexts. The spoken language is the daily life language, while the PS words are also words that belong to this linguistic context beside to their similarity to their equal words in the SA context. Accordingly, the prevalence of their use is over than the SA words that are being used just for formal and written language use only. This finding reinforces the assumption

that that learning L1 words is an easy process compared to learning L2 words because of the fact that L1 words are being used in frequent manners than L2 words during the daily life (Gollan et al. 2008). Hence, superiority effect during the performance of memory tasks such like recall and learning would be expected for learning of L1 compared to L2 words rate (Durgunoglu and Roediger 1987; Glanzer and Duarte 1971; Nott and Lambert 1968). Accordingly, the superiority effect in recalling SL and PS words compared to SA words may be attributed to the fact that the spoken language behave as L1 while the SA behave like L2 linguistic context. If this is the case, then the argument which holds that performance differences for more and less fluent languages have been explained either by the greater demand that L2 processing puts on cognitive resources or by the lower familiarity of L2 words (Francis and Gutiérrez 2012), was not supported according to the current findings of the free recall part. Francis and Gutiérrez (2012), postulate that words with L2 status need to be processed with greater cognitive demands and relying on intensive cognitive resources and accordingly memory performances in the non-dominant language are impacted by both the greater demand for cognitive resources and the lower familiarity of the words. This cognitive demand could reveal into higher hit rates, greater discrimination, and shorter response times for the non-dominant language and for lower frequency words in the dominant language. However, this argument can be partially strengthened in the current study, mainly if we look at the particular parts of the delayed retrieval and the recognition results.

Considering the average of learning rate, it was found that the overall learning rate is similar between the three conditions. This finding indicates that verbal learning in Arabic, among proficient learners, is not affected by the verbal context when it comes to language learning based on repetition of verbal material. The rate of accumulation of information stored in memory is similar regardless of the linguistic context of information which is learned. In addition and considering the general learning curve of the words from the three versions, a similar type of progress during the learning process of the words was found, with almost an identical type of recalling effect for the SL and the PS words.

The impact of diglossia on the delayed recall was not significant as well. among native Arab adults, diglossia was not found to have a significant impact on delayed retrieval of verbal information that was stored in memory after process of repetition. The current results indicated that the performances in the delayed recall of the three conditions were quite similar showing that the retrieval of verbal information that was stored in memory is not affected by the lexical status of such information.

Even more importantly, the performances in the recognition trail revealed that there is no significant differences found between the most two distinct conditions, namely the SL and the SA. Beside to this, the performances in the response categories under the recognition trail (True positives, false positives, true negatives, and false negatives) did not reveal any significant differences between the two distinct linguistic conditions. This is also highlights the fact that diglossia has no impact on the long term memory process; i.e. delayed recall and recognition of verbal information that was learned and stored earlier.

However, the findings of the current study do not support the assumption that was suggested here about the preferences of the PS word in the learning process. It was supposed that the exposure to PS words leads to conceptual activations of both the SL and SA levels simultaneously, and this will puts these words as the preferred candidates in the process of learning and memory. The overall findings in the different parts of the testing (free recall, delayed recall and recognition) did not showed a consistent superiority of PS condition over the two other conditions.

In general, the result showed that in the immediate free recall part, the performances were better for the SL and the PS conditions compared to the SA one. But, for the parts of delayed

recall and recognition after learning, the results did not revealed any consistent effect of diglossia on the performances, suggesting that the storage process is better for SL and PS words compared to the SA words, but when the storage process is completed then the process of delayed recall and recognition will be similar. This finding may contribute to understanding the structure of the dissociation reality of the short and long term human memory systems related to the processes of storage, retrieval and recognition (Flegal and Reuter-Lorenz 2014). Hence, the mere fact that the linguistic situation has affected the performance of a single function related to short term memory (immediate storage and retrieval) but not the long term memory functions (delayed recall and recognition), indicates that linguistic situation in Arabic could affect performances related to short term memory but not long term memory functions.

## Implication and the Contribution of the Current Research

The current study's findings may have essential implications for the cognitive research, teaching and learning in general and particularly learning in Arabic language. For the cognitive research, the findings will enable deep understanding of the hierarchy of the linguistic structure of the Arabic diglossic situation. Alongside, it will allow introspection on verbal memory processes in this complex lingual context. In terms of learning and teaching, the research findings may contribute to the field of learning and teaching by providing an empirical tool that could help to understand what the best context of language we can use when imparting literally knowledge for students. Unfortunately, the findings of current research are limited to be generalized for younger and beginner learners. It is important to investigate the developmental effect of the language exposure on the language preferences during verbal learning. Because of the fact that the exposure to the SA usually begin around the first grade, it could be supposed that the preferred language for learning around these earlier stages of school is the SL. For older learners, the SA becomes the main learning tool because of the intensive exposure to this language as the only one used for reading and writing. Hence, it can be postulated the learning preferences for younger learners would be for the SL while the SA is supposed to be preferred for such learning process for older learners. This postulation needs a further research and investigations.

**Compliance with Ethical Standards**

**Conflict of interest** The author has not received research Grants from any Company. The authors declare that they have no conflict of interest.

## Appendix 1

See Table 5.

**Table 5** Table of words within each version of the verbal learning tests

| PS words | SA words | SL words |
|---|---|---|
| سيجارة | مِعول | جزدان |
| عاصفة | مصعد | حاكورة |
| حُجارة | ناقوس | قشاط |
| مُغارة | ثعبان | زلفة |
| مقياس | وسادة | مجرود |
| ازهار | مِقود | شاكوش |
| تجارة | أحشاء | بِسه |
| سرير | قبعة | بزِر |
| مصبغة | كُثبان | كنباية |
| عجوز | ضفيرة | كلسات |
| كُتلة | قوقعة | كباي |
| قِشرة | قرفصاء | برودة |
| سلسلة | صمغ | شْوال |
| صقعة | مُنحدَر | ختيار |
| كاس | جِذع | جلبية |

*PS* phonological similarity, *SA* standard Arabic, *SL* spoken language

## Appendix 2

See Table 6.

**Table 6** Table of the distractors words for each version of the verbal learning tests

| PS | SA | SL |
|---|---|---|
| مِطبَعة | جدار | بلكون |
| عِشِب | نبراس | قنينة |
| زِيت | تبغ | طشت |
| سِيارة | حِذاء | مزهرية |
| مِعده | مسحوق | برداي |
| بياع | مذياع | بحص |
| طُنجرَة | هاتف | شعشبون |
| وَرْدِه | شجار | مصارين |
| كنباي | وعاء | حفاي |
| مَفَك | حذاء | راديو |
| مَكتَب | امعاء | حداي |
| مُفتاح | عازل | تلفون |
| خزانة | ضِرس | مصاري |
| طابِه | عَرش | غلاي |
| مغسَلِة | مجهر | قُطِف |
| مِسطرة | شامخ | رغوة |
| صرصور | مسربل | خزق |
| عصفور | عويل | فستيان |
| ثلج | خاضع | زعرورة |
| كعكة | غبن | عرباي |
| فستان | ضغينة | جورة |
| حُرش | اصفاد | حْرام |
| سَفينَة | كهف | قرقعة |
| عَظمَة | منتدى | بريص |
| لِسان | كرب | خُشُم |

*PS* phonological similarity, *SA* standard Arabic, *SL* spoken language

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