Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

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ABSTRACT

To see if there is a correlation between attention and short-term memory recall and to examine attention as a factor affecting memory recall of Arabic and abstract words through free, cued, and serial recall paradigms.

Methods: *Four groups of undergraduates in King Saud University, Saudi Arabia participated in this study. The first group consisted of 9 undergraduates who were trained to perform three types of recall for 20 Arabic abstract and concrete words. The second, third and fourth groups consisted of 27 undergraduates where each group members were trained only to perform one recall type: free recall, cued recall and serial recall respectively. Attention level was the independent variable and number of recalled abstract and concrete words was the deponent variable. The used materials in this study were: abstract and concrete words classification form based on four factors was distributed to the participants (concreteness, image ability, meaningfulness, and age of acquisition), three oral recall forms, three written recall forms, and observation sheets for each type of recall. Three methods were used: auditory, visual, and written methods.*

Results: *A Pearson product-moment correlation coefficient was computed to assess the relationship between the paid attentional efforts (concentration) and short-term memory recall (recalled Arabic abstract and concrete words). There was a positive correlation between the two variables, $r = 0.713$, $n = 440$, $p = 0.000$, with $R^2 = .508$. Overall, there was a moderate, positive correlation between attentional efforts and short-memory recall.* ***Conclusions:*** *Increases and decreases in paid attentional efforts were correlated with increases and decreases in retrievable and non-retrievable Arabic abstract and concrete words (short-term memory recall).*

Keywords: abstract words; concrete words; free recall; cued recall; serial recall; recall effects, attention; factors affecting short-memory recall, short-term memory

INTRODUCTION

Principally, word recall is intricately linked to human memory where different processes take place. The recall process in the short-term memory is entirely different from the recall process in the long-term memory albeit the latter would be an extension for the former. Detailed explanations about these processes which are beyond the scope of this study can be seen at (Atkinson & Shiffrin, (1968); Aitchison, (1987); Greene, (1987); Sprenger, (1999); Baddeley, (1999); Hoelscher, (2001); Parker, Wilding & Bussey, (2002); Byrne, (2003); Baddeley, (2004); Basçar, (2004); Cowan, (2005); Pickering, (2006); Mace, (2007); Kliegel, McDaniel & Einstein, (2008); Menzel, (2008); Foster, (2009).

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With reference to cognitive psychology, there are a number of factors which affect memory recall, (see Styles, 1997, Randall, 2007, Conway & Bristol, 1997, and Eichenbaum, 2002).

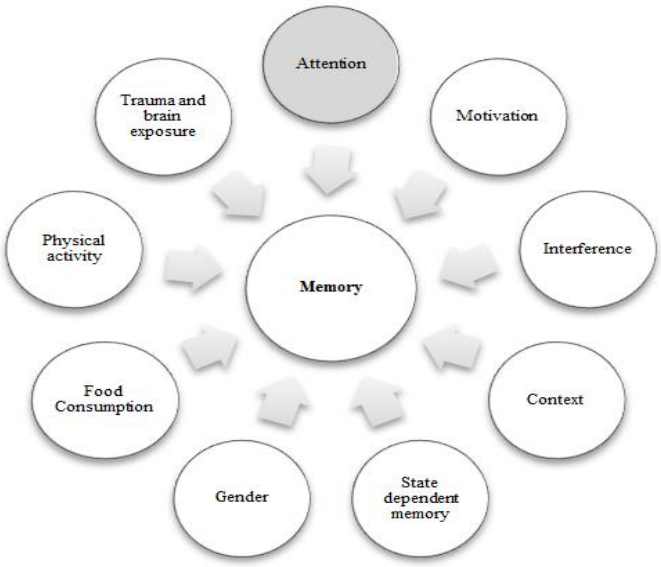

Figure 1. Factors Affecting Memory Recall

The above mentioned factors in figure (1) can either affect memory positively or negatively. In other words, each of which can either support the memory to recall and this would be considered as a positive effect, or hinder memory to recall properly and this would be considered as a negative effect, (see 2000, Mole, 2008; Leclercq and Zimmermann 2002; Jimenez, 2003). This paper examines the effect of one of the above nine factors on memory recall of Arabic abstract and concrete words recall using free, cued, and serial recall paradigms. The examined factor here is attention.

Principally, attention, refers to 'a state of awareness in which the senses are focused exclusively and selectively on aspects of the environment. Therefore, the central nervous system is in a state of readiness to respond', (Psychology Dictionary, 2012, para 1). It also refers to 'sustained concentration on a specific stimulus, sensation, idea, thought, or activity, enabling one to use information-processing systems with limited capacity to handle vast amounts of information available from the sense organs and memory stores', (OxfordIndex, 2012, para 1).

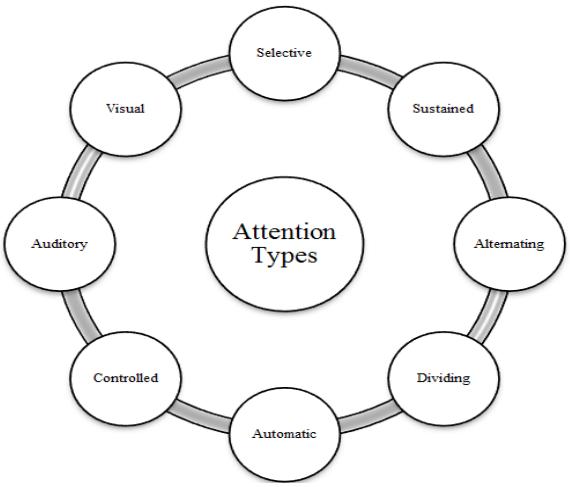

Figure 2. Types of Attention

As a cognitive process, attention 'is strongly linked in the philosophy to the nature of consciousness, self-awareness, and most theories of the mind', (Cohen in Springer-Reference, 2014, para 1). The function of attention 'can either be environmental stimuli actively being processed by sensory systems, or associative information and response alternatives generated by ongoing cognitive activity', (ibid). Attention has a number of types as illustrated in figure 2, (see James, 1890; Howe, 1998; Cohen in Springer-Reference, 2014).

Several studies have been conducted examining the effect of attention on memory recall from different perspectives: divided attention effect on memory recall (Pimentel & Albuquerque, 2013), focused attention to improve recall (Hertel, Benbow, & Geraerts, 2012), attention and word frequency (Cao, 2012), and cognitive factors affecting free recall and cued recall (Yamagishi, Sato, & Sato, 2012). Consider also the studies and presented literature of Dudley, (1986); Faust, (2012); Mense, Debney & Druce, (2006); Monsell & Driver, (2000); Psychology-Stanford, (2007); Pulvermuller, (2002); Shiffrin & Nosofsky, (1994); UKEssays-Editors, (2014).

Mandler's study as cited in MacLeod & Kampe, 1996 proposed that diversion in attention between and among low frequency and high frequency words "could help to minimize the frequency effect both by disrupting elaboration of high frequency words and by improving the encoding of low frequency words" (p. 140). (Mulligan, 1998) examined the role of attention on memory recall proposing that dividing attention affect memory measures. Rajaram, Srinvas & Travers, 2001 presented empirical data confirming the effect of dividing attention on explicit memory recall. Carou, Redondo, & Pineiro, 2011 concluded their study about attentional processing and recall of emotional words with that using two semantic categories may help finding attention differences but not in the case of using a single semantic category. Other studies and materials which present attention in relation to short-term memory recall include: Gruszka, Matthews & Szymura, (2010); Parault & Schwanenflugel, (2000); Psychology-Stanford, (2007); Styles, (2005); Thorndike, Bergman, Cobb & Woodyard, (1927); Tsotsos, Itti, & Rees, (2005); Ward, (2004); Dice, & Schwanenflugel, (2012); Piai & Roelofs, (2013).

Studies of concreteness effect from different perspectives have also approved the effect of concrete words over abstract ones in terms of better recall and having more activated parts in the brain. Among these studies is (West & Holcomb's, 2000) who conducted an experimental study claiming supporting the previously finding that concrete concepts and/or words over abstract ones in terms of cognitive processing. The study consisted of 36 students in the age range (19-23) divided into through groups where each group represent one investigated level: imagery, semantic and surface levels. The researchers made use of reaction time (RE) and even-related brain potential (ERP) as tool measurements for their research. The ERs were shorter in both the imagery and semantic tasks for concrete words than abstract ones specially the imagery task. Besides, concrete words elicited more negative ERPs than abstract ones.

Bergelson & Swingley, 2013 also investigated the acquisition of abstract and concrete words by infants whose age range from 6-16 months old. 50 infants participated in the study and were divided into three age groups. The researchers used 14 videos displayed on an LCD screen. A general conclusion is this research is that infants of 10 months old were able to "identify novel referents of common words that do not refer to concrete objects, but young infants do not", (p. 396). More importantly, it is proposed that both abstract and concrete words' acquisition do differ "ontogenetically" and "may require skills with differing developmental trajectories", (ibid).

Additionally, Duñabeitia, Avilés, Afonso, Scheepers, Carreiras, 2005 conducted a research about the representation of abstract and concrete words where in this topic was investigated

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and supported from a qualitative point of view. In other words, unlike the above mentioned studies which investigated this topic quantitatively supporting their claim by that concrete words have more cognitive base over abstract words due to more referents, in this study the qualitative views are supported where it is assumed that abstract word are recognized and represented in terms of semantic associations and concrete ones are represented in terms of semantic similarity. Crutch & Warrington, 2005, p. 623 proposed according to the qualitatively different representational framework that "abstract concepts are represented in an associative neural network whereas concrete concepts have a categorical organization". The participants of this study were 30 native Spanish speakers and the material used was two sets of displayed pictures representing both abstract and concrete words. A drawn conclusion supporting the view of that the students stared more and earlier when looking at visual words representing abstract concepts rather than the concrete ones.

In addition, Fliessbach, Weis, Klaver, Elger, & Weber, 2006 examined abstract and concrete words processing on the basis of the notion that concrete words are generally better than abstract ones in terms of more successful remembering. The study was based on two theories, both supporting the view that concrete words, but not abstract ones are more accurately remembered. The first theory is called *dual-coding theory* and the second one is called *context-availability theory*. The former theory states that concrete words are over abstract ones because they possess "dual coding … in the form of a verbal and sensory code", (p. 1413). The latter theory states again that concrete words are over abstract ones because they possess "a more accessible semantic network", (Fliessbach, Weis, Klaver, Elger, & Weber, 2006, p. 1413). The researcher made use of the even-related functional magnetic resonance imaging (fMRI) technique as a tool for testing their proposed prediction. Twenty one (21) subjects without any neurological or psychiatric history in the age range (19-43) participated in the study. The material of the study was 180 abstract words and 180 concrete words, selected and identified as among the most frequent German words. The drawn conclusion was in favour of more significance in the case of concrete words over the abstract ones in terms of activated places in the brain.

Moreover, Dahlstrom, Ultis, 2014 investigated the view that concrete words but not abstract ones are generally recognised more by humans. Using an attractor network "a recurrent neural network designed to settle to a stable output over time", (p. 1) the researchers attempted analysing the human behaviour towards language processing. It was concluded that the concrete words are more recognizable than the abstract ones, not because of their highly intensive representation, but of being more "reinforced" (p. 6) in terms of learning [input].

Furthermore, Walker & Hulme, 1999 evaluated in their study immediate serial recall (ISR) and maximal speech rate (MSR) of abstract and concrete words differing in length. Four experiments were conducted the general conclusion was that concrete words have an advantage over abstract ones in terms of being recalled faster than the abstract ones, yet in terms of the direct semantic effect in relation to short-memory.

Besides, Dukes & Bastian, 1966 tested immediate free recall (IFR) of abstract and concrete words using a list of 10 abstract words and 10 concrete words, more specifically nouns. The words were shown to the participants by a projector twice. It was concluded that the participants recalled more concrete words than abstract ones.

Again, Wang, Conder, Blitzer, & Shinkareva, 2010 examined the availability of possible differences in the neural representation of abstract and concrete words in the brain. The researchers used the meta-analysis technique—analysing combined data of 303 participants in 19 published studies. It was concluded that a noticeable consistent differences in the the

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neural representation of abstract and concrete words were documented. In other words, different activated regions for both abstract and concrete words were proved by the use of the fMRI imaging technique. It was induced that while abstract words may involve verbal system in processing and representation, concrete words, on the other hand, involve the perceptual system.

Once again, Hill, Korhonen & Bentz, 2014 presented an analytical study evidencing the different organization of abstract and concrete concepts in the mind. The researchers made use of the three sources of words: 1) University of South Florida norms (USF), 2) Word-net programme, and 3) Brown corpus. The researchers concluded that: 1) abstract and concrete concepts have differing patterns of associations with other concepts, 2) abstract words are organized in terms of associations compared with concrete ones which are organized in terms of semantic similarity, and 3) concrete representation are more feature-based than the abstract ones.

Pobric, Ralph & Jefferies, 2009 examined also the role of the anterior temporal lobes in the comprehension of abstract and concrete words using the Repetitive Transcranial Magnetic Stimulation (rTSM). 12 native English speakers without any neurological or psychiatric history participated in the study. Final results indicated that both left and right temporal poles 'make critical contribution to semantic processing even for abstract concepts that do not have strong sensory representation", (p. 1104).

In addition to the studies mentioned above, Prior, Cumming & Hendy, 1984 tested using dichotic listening paradigm the hypothesis that while concrete words are processed equally in both left and right hemispheres of the brain, abstract words, on the other hand, have an advantage in that the left hemisphere is superior in case of processing them. 16 female and 16 male subjects participated in the study using 110 paired items as a listening material. Results indicated no significant evidence showing differences in the role of the two hemispheres of the brain in regard to abstract and concrete words.

One more study is that by Pichette, Serres, Lafontaine, 2011 who investigated the effectiveness of writing and reading sentences in incidental acquisition of new vocabulary in second language. The researchers hypothesized that: 1) writing sentences will be better to promote more new vocabulary acquisition than reading sentences, 2) concrete words will be better remembered than abstract ones, and 3) writing leads to better recall of new words than reading and concrete words are better to recall than abstract words. The participants were 203 English-speaking from Québec, Canada. The researchers made of use of 9 rare abstract and 9 concrete nouns. Immediate and delayed serial recall analyses indicated superiority of writing task over reading task and of concrete words recall over abstract words. Thus, this plus point for both writing task and concrete words in terms of delayed recall—vanishes gradually.

By and by, this study aims at studying the effect of attention on memory recall of Arabic abstract and concrete words using free, cued, and serial recall paradigms. In other words, it attempts answering the following questions:

1. There is a possibility that attention affects word memory recall;
    a. The number of recalled words increases when less attentional efforts are paid;
    b. The number of recalled words decreases when more attentional efforts are paid; and
    c. Abstract words are better recalled than concrete ones in free, cued and serial recall paradigms be it with more or less attentional efforts.
2. There might be a (correlation) between attention and short-term memory recall of Arabic abstract and concrete words.

ISSN: 2307-3721, e ISSN: 2307-3713

METHOD

Sample

The population of interest in this study is all university students in the undergraduate level who meets the following criteria: 1) native-speakers of Arabic Language; 2) registered in the university as undergraduate students; and 3) typical neurological and clinical history. The following table (2) shows the characteristics of the subjects in this study.

Table 1. Characteristics of Subjects

Age Range	20-24
Mother Tongue Language	Arabic Language
Dialect	Saudi Arabic Language
Ethnicity	Islam
Other Languages	English (EFL use)
Gender	Male (single and married)
Nationality	Saudis
Specific Characteristic	Be enrolled in a BA programme in the university level (King Saud University).

Probability sampling method, mainly *stratified sampling* method was used in this study where one class out of many available classes was picked randomly to take part in this study. The class has 36 students from the college of Engineering who are enrolled in prerequisite English Language course in the College of Languages and Translation, King Saud University, Riyadh, Kingdom of Saudi Arabia, in 2013, late December. The class was divided randomly into four groups as shown in table (2) below.

Table 2. Population Distribution

Task Type	*Group 1*	*Group 2*	*Group 3*	*Group 4*
Free Recall	A			A
Cued Recall		B		B
Serial Recall			C	C
Required/Paid Attention Level	low	low	moderate	high

The selected sample is aimed to be representative of the population of interest and that reached results are generalizable for populations with similar characteristics. In other words, the study investigates a language acquisition topic from both cognitive and psycholinguistic perspectives and the targeted population is native speakers of Arabic so external effects like time, place and people cannot affect the generalizability of this study as long as they have similar characteristics to the above mentioned ones.

Measures

Two measures were used in this study: one is a list of 20 Arabic abstract and concrete words and an observation sheet of the observed effects of recall types.

ISSN: 2307-3721, e ISSN: 2307-3713

To start with the first measure, a list of 20 Arabic words where 20 are abstract and 20 are concrete was used in this study. The words were selected on the basis of semantic relationship where one word could relate to another in terms of meaning but differ from one another in terms of concreteness. For instance, the words: mind and brain which are both semantically related but actually different from one another. It should be noted that by stating semantically similar is to mean that they share same associations and a person can think of both words when provided by certain cues and/or associations.

The list of the 20 abstract and concrete words were selected to measure abstract and concrete words processing and recall through free, cued, and serial call tasks. The list of the words, yet more procedural issues could be followed in the procedures section below and in the appendix.

Both validity and reliability were calculated in this used measurement tool. In detail, in the case of construct validity: both face and content validities were calculated to represent translation validity. Face validity was calculated by the principal researcher and another PhD student of Arabic Language from the Department of Arabic Language and Literature, College of Arts, King Saud University, Riyadh, Kingdom of Saudi Arabia. Both of them indicated very good face validity for the list of the words. For content validity, again, the list of the words was divided into two types in terms of content: abstract and concrete, yet in terms of semantic relationship between the abstract and concrete pair of words. In other words, the abstract word must have an association with the concrete words in order to be included in the list; otherwise, it will be excluded and replaced by another pair of words. One type only of criterion-related validity, namely, predictive validity, was calculated in this study (see tables 3 & 5 below).

To move to reliability, two types of reliability were calculated: inter-rater and internal consistency reliability. Inter-rater reliability was measured by researchers who divided the words into two lists: abstract and concrete words on the basis of the following criteria: concreteness, imageability, meaningfulness (Paivio Norms), and age of acquisition, (MRC Psycholinguistic Database, 2013). The list of words was rated twice to make sure that the list of the abstract words are those with negative significant concreteness, zero or negative imageability, and vague and/or ambiguous meaning(s), and the concrete words are those with positive significant concreteness, high or positive imageability, and clear-cut meaning(s). Tables (3-5) below display and summarize the calculated validity and reliability types and their values.

Table 3. Reliability & validity results of abstract and concrete words scale

Reliability	*Statistical Tool & Result*		*Validity*	*Statistical Tool & Result*	
Inter-rater	Tool Pearson	Result .80, .80, .78	Face	Tool 2 raters	Result High
Internal	Cronbach	.82	Content	Categories	Excellent
			Predictive	Pearson	.49
			Concurrent	Uncalculated	
			Convergent	Uncalculated	
			Discriminant	Uncalculated	

ISSN: 2307-3721, e ISSN: 2307-3713

Table 4. Internal consistency reliability of the abstract and concrete words scale

Feature	*Corrected Cronbach's Alpha*	*Cronbach's Alpha if Item Deleted*
Concreteness	.71	.78
Imageability	.70	.78
Meaningfulness	.69	.80
Concreteness and Abstractness	1.00	.71

Table 5. Construct validity of the abstract and concrete words scale

Feature	*R value*	*R Value*	*R value*	*R value*
Concreteness	.46	.47	.40	.80
Imageability	.46	.44	.37	.80
Meaningfulness	.46	.44	.38	.78
Age of Acquisition	.40	.37	.38	.49
Concreteness And Abstractness	.80	.80	.78	.49

*Indicates insignificant values, ** indicate low level validity, all other values are significant at the 0.01 level.

The second measure was an observation sheet where in the administrator of the research was provided with—to document his observations following the given instructions in the provided sheet (see appendix)

Design

A four group quasi-experimental randomized design was used in this study. The design can be depicted in notational form as:

R $X^{-}_{1,2,3}$ O_{1} $O^{+}_{1,2}$

R $X^{-}_{1,2,3}$ O_{2} $O^{+}_{1,2}$

R $X^{-}_{1,2,3}$ O_{3} $O^{+}_{1,2}$

R $X^{-}_{1,2,3}$ O_{4} $O^{-}_{1,2}$

Where:

R = indicates that the groups were randomly assigned

X- = indicates words processing methods (1 = auditory, 2 = visual, and 3 = writing), (-) indicates that it is non=treatment research

O = indicates the measurement tools used in the study

O = the first O stands for the observation sheet for recall types (1: means only free recall task which requires low level of attention, 2 means cued recall task which also requires low level of attention as supported by cues, 3 means serial recall which

requires moderate level of attention as the participants need to recall serially and 4 means free, cued, and serial recalls which requires high level of attention)

O = the second O stands for observing which type of words comes over which, that is abstract words are better recalled than content words or vice versa. The numbers in lower case stand for (1 = abstract words, and 2 = concrete words), (+) means the possibility that number or recalled words increases when less attentional efforts are paid/required) and (-) means the possibility of that number or recalled words decreases when more attentional efforts are paid/required.

The first three groups were compared to group 4 to see first if words recall is correlated with attention and then to see if attention affects word recall. The independent variable was the paid attentional efforts—represented by performing sequential yet subsequent recall paradigms (free, cued and then serial). On the other hand, the dependent variable was the number of recalled abstract and concrete words in low and moderate attention group(s) and the high attention group.

Procedure

Between 01.02.2014 and 01.03.2014, the study was conducted and all the following procedures were arranged and followed.

Data collection: an observation sheet for documenting the observed effects was designed where the subjects were first provided with a list of 20 words and asked to classify them into both abstract and concrete words. Before that the students are provided with very basic information about the differences between abstract and concrete words. Moreover, they were introduced with related terms to classification process: concreteness, imageability, meaningfulness (Paivio Norms), and age of acquisition, (MRC Psycholinguistic Database, 2013). Having done that, then the list of words was presented to the students using three methods:

1. Auditory methods: the administrator of the research reads the words aloud to the students;
2. Visual method: the administrator of the research presents the list of words to the student using an over-head projector (OHP) and powerpoint slides where each word is presented as a card (pictures are may be provided next to each word); and
3. Writing method: the administrator of the research asks the students to read the words aloud and write them from the over-head projector in the paper-notes they are provided with.

The next step was asking the students to start recalling the words they can recall from both abstract and concrete words. Of course, the same procedures will be followed to the four groups with following differences:

i. Group one attempted only free recall (low attention level);
ii. Group two attempted only cued recall (low attention level);
iii. Group three attempted only serial recall (moderate attention level); and
iv. Group four attempted free, cued and serial recalls (high attention level).

Authenticity

The students were informed by their instructor and were given the chance to take part or not before being the subjects of the study. Having agreed, the students are assured to have full

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authenticity about the collected data and restricting its use for research purposes only. Needless to say, all the above procedures were officially documented using a consent form signed by each student confirming his free willingness to participate in the study.

Measures Administration

The two used measures were administered by the instructor of the course after being trained by the one of the researchers. The instructor was provided with all kinds of instructions that should be followed (detailed procedural issues can be seen in the appendix).

Time and Environment of the Measurement Tools

The study was conducted in the College of Languages and Translation, King Saud University, Riyadh, Kingdom of Saudi Arabia. Each student was called individually into a well-prepared classroom with comfortable chairs, over-head projector, good air conditioning, and lightening. The used time for all the above described steps to be performed was about 26 minutes (4 minutes for each for those who were assigned to recall 20 words, and 2 minutes for each for those who were assigned to recall only 10 words).

Administering

The following steps were followed for administering the measurement tools in this study:

1. The administrator of the research provides the students with the list of 20 words requesting them to classify them into two lists: abstract and concrete words;
2. The administrator of the research collects the words' lists from the students;
3. The administrator of the test makes sure that none of the students has any words lists remaining with them;
4. The administrator of the test reads the list of words aloud (abstract-concrete or concrete-abstract) to the students;
    a. The students are requested to say the words which they can recall;
    b. The administrator of the research documents the recalled words in both cases; and
5. The administrator of the research presents the words to the students using an over-head projector (OHP) requesting them to:
    a. read them silently;
    b. read them either aloud, finger pointing or lips-moving; and finally
    c. write them down
    d. the students are requested to note down the words they could recall

Assessing

The researchers but not the administrator of the research (the instructor of the course) does the calculations for the following:

1. Number of recalled abstract words as opposed to number of recalled concrete ones.

Recall Prompts

First letter prompt, miming and or sign-language in addition to semantic associations were provided in some cases (see appendix for more details).

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Preliminary Analysis Steps

Using the 17th version of SPSS (Statistical Package for Social Sciences), both descriptive and referential statistics tools were used to test proposed hypotheses in this study.

RESULTS

17th version of SPSS (Statistical Package for Social Sciences) was used for the statistical analysis of the collected data. Both descriptive and referential statistics were used where different yet suitable statistical tools were used from each to serve the purposes of the study. Table (6) below presents the used type of statistics, the selected tool and performed function. To remind ourselves of the proposed hypotheses in this study, they are:

1. There is a possibility that attention affects word memory recall;
   a. The number of recalled words increases when less attentional efforts are paid;
   b. The number of recalled words decreases when more attentional efforts are paid; and
   c. Abstract words are better recalled than concrete ones in free, cued and serial recall paradigms be it with more or less attentional efforts.
2. There might be a (correlation) between attention and short-term memory recall of Arabic abstract and concrete words.

Table 6. Summary of the statistical tools used in analysing the data of this study

Statistics Type	*SPSS Tool(S)*	*Purpose of Use*
Descriptive Statistics	Frequency	Total number of recalled words
		Total number of recalled abstract words
		Total number of concrete words
		Observed effects
	Mean	The central location of the recalled words in free, cued, and serial recall paradigms
	Standard Deviation	Measuring variability among recalled words in free, cued, and serial recall paradigms
	Frequencies: Graphs	Description and comparisons purposes
Inferential Statistics	Pearson	Reliability and validity issues
	Cronbach alpha	Reliability
	Correlate: Bivariate	Getting the correlation coefficient and degree of significance and deciding on whether there is a relationship or not between the two tested variables
	Graphs: scatter-plot	Seeing in clearer way the correlation between the two tested variables and ascertaining the presence or absence of relationship between the two tested variables

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There were 36 participants in this study, divided into two groups. Group 1 acted as three sub-groups where they performed free, cued and serial recall paradigms subsequently. Group 2 was divided into 3 groups, 9 in each where each group consisting of 9 students performed only one recall type. Percentage of total recalled Arabic abstract and concrete words in both groups are presented comparatively in figure 3 below.

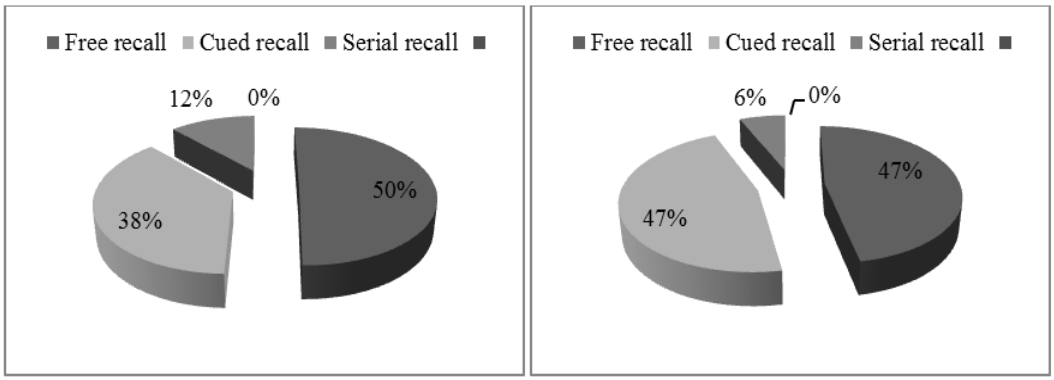
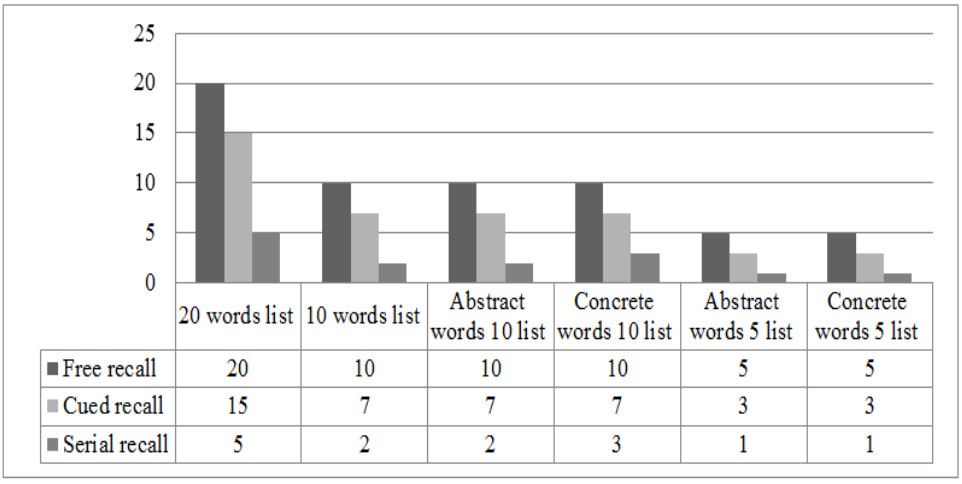


Figure 3. Comparison of the performance of one (A) and three groups (B) in three recall types

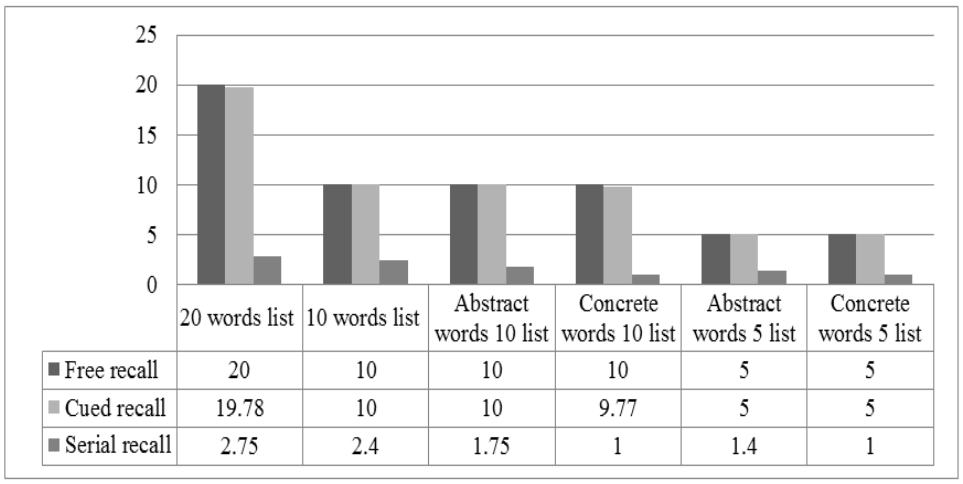
Both pie charts can be read counter clockwise. The pie chart to the right side presents the percentages of the three groups (the control group) (9+ 9+ 9=27) and the pie chart to the left side presents the percentages of the experimental group. In both pie charts, free recall is the highest and serial recall is lowest. The percentage of experimental group (50) is insignificantly higher than the percentage of the control group (47%). On the other hand, the percentage of the control group (47%) is higher than the percentage of the experimental group (38%) in cued recall paradigms. Similar to free recall paradigms where the percentage is higher in the experimental group than in the control group so is it in the serial recall paradigms (12%) for the former and (6%) for the latter. This very early statistics gives us an impression that there might be a [correlation] between attention and memory recall of Arabic abstract and concrete words though the differences in percentages between the two groups are not statistically different.

Detailed statistical results for the recalled Arabic abstract and concrete words in the control and experimental groups are shown in figures 4-5 below.



	20 words list	10 words list	Abstract words 10 list	Concrete words 10 list	Abstract words 5 list	Concrete words 5 list
Free recall	20	10	10	10	5	5
Cued recall	15	7	7	7	3	3
Serial recall	5	2	2	3	1	1

Figure 4. Comparison of recalled words in different performed tasks of free, cued, and serial recall paradigms

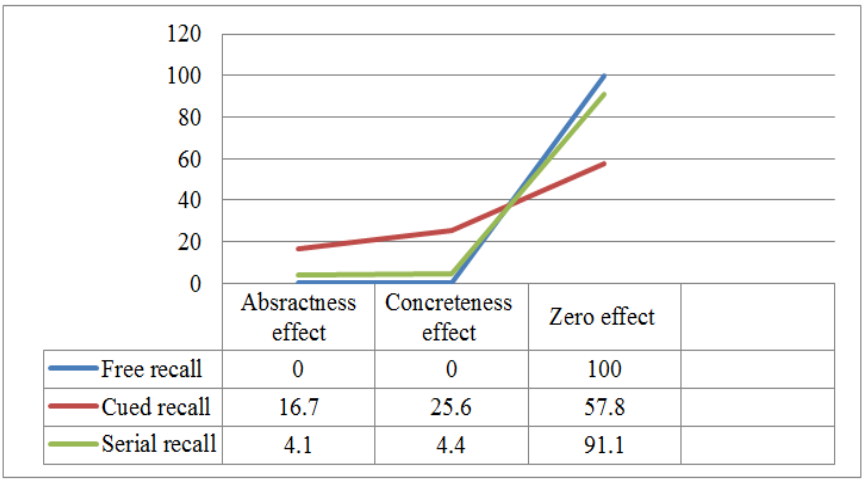


	20 words list	10 words list	Abstract words 10 list	Concrete words 10 list	Abstract words 5 list	Concrete words 5 list
Free recall	20	10	10	10	5	5
Cued recall	19.78	10	10	9.77	5	5
Serial recall	2.75	2.4	1.75	1	1.4	1

Figure 5. Comparison of recalled words in different performed tasks of free, cued, and serial recall paradigms

Figure 4 presents results for the experimental group whereas figure 5 presents results for the control group. In both control and experimental groups, the whole number of words was fully retrieved in free recall paradigms. In cued recall paradigms, the mean for the number of the recalled words is minimally less in the experimental group than the number of the recalled words in the control group (15) for the former and (19.78) for the latter. As for serial recall, it is surprisingly higher in the experimental group than in the control group (5) for the former, and only (2.75) for the latter. These current results might indicate either a negative correlation or zero correlation as the differences in descriptive statistics are not significantly different between the results of memory recall and attention.

It was also proposed in our study that abstract words are better recalled than concrete ones in free, cued and serial recall paradigms be it with more or less attentional efforts. Statistical results for this claim are shown in figures (6-7) below.

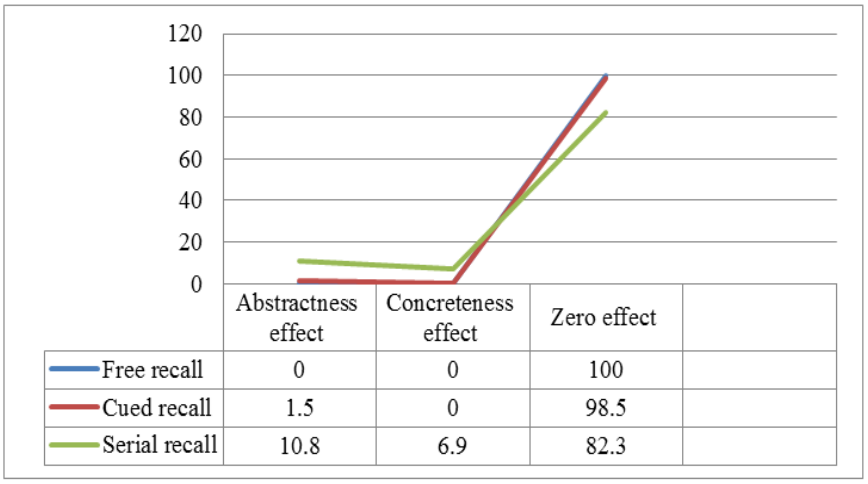


	Absractness effect	Concreteness effect	Zero effect	
Free recall	0	0	100	
Cued recall	16.7	25.6	57.8	
Serial recall	4.1	4.4	91.1	

Figure 6. Abstractness, Concreteness, or Zero Effect?

First it should be noted that figure 6 presents results for the experimental group and figure 7, on the other hand, presents results for the control group. According to the two figures, in both control and experimental groups (with less and more attentional efforts) the effect is neither abstract (advantage of abstract words over concrete ones) nor concrete (advantage of concrete words over abstract ones), it is rather zero effect (identical number of recalled Arabic abstract and concrete words).

ISSN: 2307-3721, e ISSN: 2307-3713



	Abstractness effect	Concreteness effect	Zero effect	
Free recall	0	0	100	
Cued recall	1.5	0	98.5	
Serial recall	10.8	6.9	82.3	

Figure 7. Abstractness, Concreteness, or Zero Effect?

Both abstractness and concreteness effect remained stable and zero effect went up to (100) in free recall paradigms in the experimental and control groups. This similar results is due to the fact that the students in the experimental groups are still with their full memory energy where the required more attentional efforts have not been paid yet.

In cued recall, there is a considerable sudden change where abstractness effect went up from (1.5) in the control group to (16.7) in the experimental group. Similarly, there is also a fast negligible change in the case of concreteness effect which picked up from (0) in the control group to (25.6) in the experimental group. Besides, there is a sharp substantial decline in the case of zero effect which deteriorated to (57.8) in the experimental group before it was (98.5) in the control group. This means clearly that the more the attentional efforts are the less recalled words are.

In the case of serial recall paradigms, abstractness effect dropped gradually down to (4.1) in the experimental group. Similarly, concreteness effect did down to (4.4) before it was less than (7). On the other hand, zero effect increased gradually to (91.1) in the experimental group before it was only (82.3) in the control group.

To conclude, in spite of the gradual yet significant changes in the results between the two groups, it is still too early to decide whether memory recall of words is correlated with with attention or whether more attentional efforts affect memory recall or not.

More descriptive statistics will help us reach a solid decision about this issue before starting the analysis of referential statistics. Comparisons of observed effects in both the experimental and control groups for the types of recall are presented in figures 8-11.

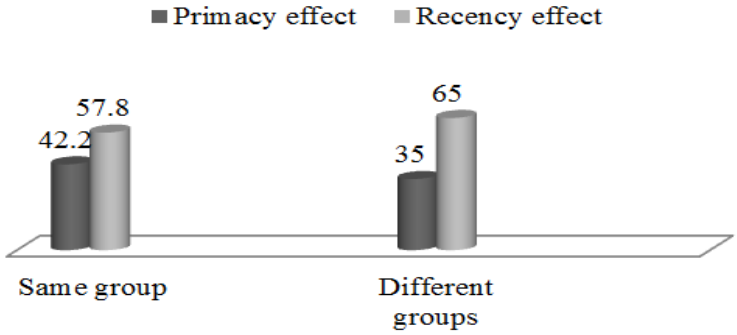


Figure 8. Effects comparison in free recall paradigms

The above bar chart presents comparatively the observed effects in control and experimental groups in free recall paradigms. There were two observed effects in free recall paradigms, namely primacy and recency effects. It can be seen clearly that in both groups recency is the most popular effect, while primacy is the least popular one.

To begin, primacy effect is more frequent in the experimental group than the primacy effect in the control group. It goes up in the former to (42.2) and then goes gradually down in the latter to exactly (35). On the hand, recency effect is more frequent in the control group than the recency effect in the experimental group. It picked up in the former to exactly (65) and then slips back in the latter to less than (58).

Thus, recency effect is generally more frequent than the primacy effect. Also, while primacy effect is higher in the experimental group and lowers in the control group, recency effect is conversely higher in the control group and lower in the experimental group.

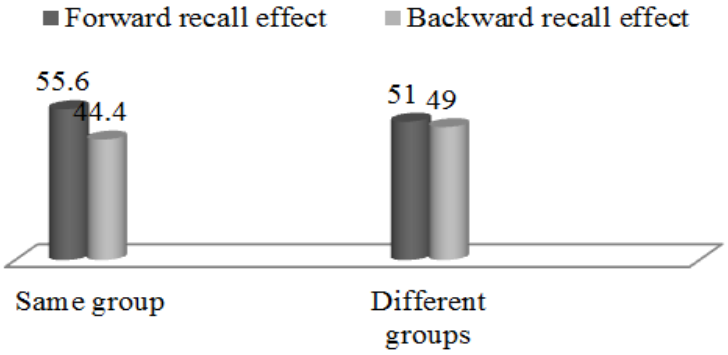


Figure 9. Effects comparison in cued recall paradigms

The above bar chart deals with observed effects in both experimental and control groups in cued recall paradigms. There were two observed effects in cued recall paradigms of Arabic abstract and concrete words, mainly forward and backward recalls. It is immediately apparent that forward recall effect is the most common observed effect and backward recall is least common observed effect.

To start, forward recall in the experimental group is more popular than it is in the control group. It improves to over (55) in the experimental group and stops at (51) in the control group. In comparison, backward recall in the experimental group is less popular than it is in the control group with only a slight change at the rate of less than (4). That is to say, it stops at less than (44) in the former and reaches (49) in the latter.

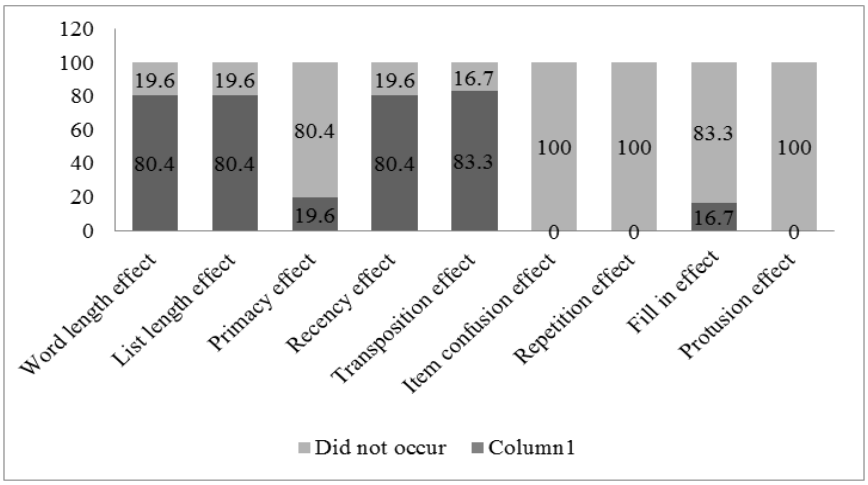


Figure 10. Comparison of observed effects in serial recall paradigms

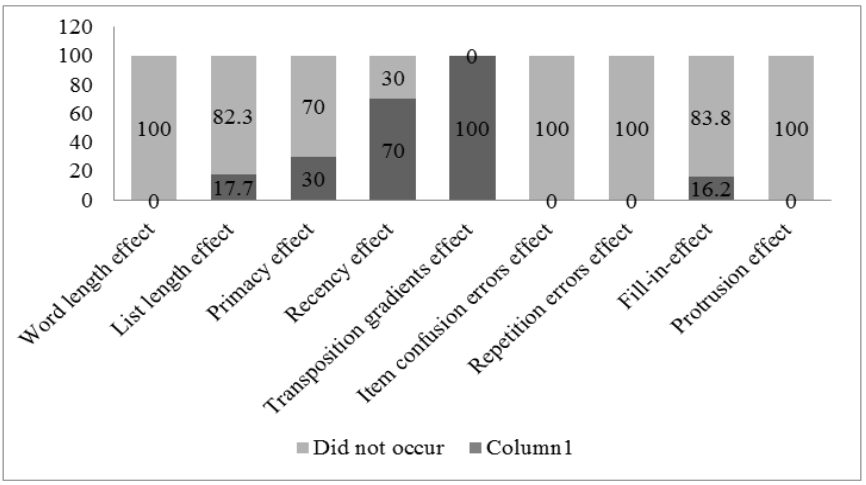


Figure 11. Comparison of observed effects in serial recall paradigms

In conclusion, forward recall effect is generally more observed than backward recall effect during cued recall paradigms in both the experimental and control groups. Yet, forward recall effect has an advantage over backward recall effect in the experimental group while the latter has an advantage over the former in the control group.

The above bar charts (10-11) show the observed effects during serial recall paradigms of Arabic abstract and concrete words for both experimental and control groups. While the first bar chart represents the experimental group, the second one represents the control group. There were nine pre-specified effects to be observed—as mentioned above in the bar charts during serial recall paradigms. Generally, there are three non-observed effects in the experimental group and four in the control group.

In the beginning, while there were three non-observed effects in the experimental group (item confusion error, repetition error and protrusion effects), there were four in the control group (the above mentioned three in addition to word length effect). Moreover, the most frequent occurring effect in both experimental and control groups was transposition gradients effect with being higher for the control group (100) as compared to less than (84) for the experimental group. On the other hand, the least frequent occurring effect for both groups again was the fill-in effect with a slight difference in favour of that for the experimental group (16.7) as compared to (16.2) for the control group.

Some major differences between the two groups in regard to the observed effect include that while word length effect did not occur at all in the control group, the occurrence rate climbs rapidly yet dramatically to over (80) and non-occurrence rate slips back sharply to less than (20). One more noticeable yet sudden change is that for list length effect. The occurrence rate bottomed out in the experimental group to less than (19) after it was over (82) in the control group. On the contrary, the non-occurrence rate rose considerably yet quickly to over (80) in the experimental group after it was only less than (18) in the control group.

To sum up, some of the pre-specified effects were not observed at all in both groups and some others were observed in both groups with a preference for the occurrence of the observed effect to the experimental group.

In order to reach solid yet better results for the proposed hypotheses in this study, referential statistics tools were used. The means and standard deviations of the independent variable (attentional efforts) and dependent variable (recalled Arabic abstract and concrete words abbreviated to short recall memory) are presented below in table 7.

Table 7. Descriptive Statistics

	Mean	*Std. Deviation*	*N*
Short Term Memory Recall	1.7523	.43218	440
Attention	1.6614	.47378	440

It can be clearly seen from the two means for the independent variable and the dependent variable that the mean for the former (M: 1.66) with a standard deviation of (SD: .47) is slightly lower the mean for the latter (M: 175) with a standard deviation of (SD: .43). This clearly initially indicates a correlation between the two variables from one side and the effect of one variable on the other, mainly the independent one on the dependent one (attentional efforts on short-term memory recall). These above mentioned inferences are verified more in table 8 below.

Table 8. Correlations

		Short Term Memory Recall	*Attention*
Short Term Memory Recall	Pearson Correlation	1	.713**
	Sig. (2-tailed)		.000
	N	440	440
Attention	Pearson Correlation	.713**	1
	Sig. (2-tailed)	.000	
	N	440	440

** Correlation is significant at the 0.01 level (2-tailed)

A Pearson product-moment correlation coefficient was computed to assess the relationship between the paid attentional efforts (concentration) and short-term memory recall (recalled Arabic abstract and concrete words). There was a positive correlation between the two variables, r = 0.713, n = 440, p = 0.000, with R^2 = .508. A scatterplot summarizes the results Figure 12. Overall, there was a moderate, positive correlation between attentional efforts and short-memory recall. Increases in paid attentional efforts were correlated with increases in non-retrievable Arabic abstract and concrete words (short-term memory recall).

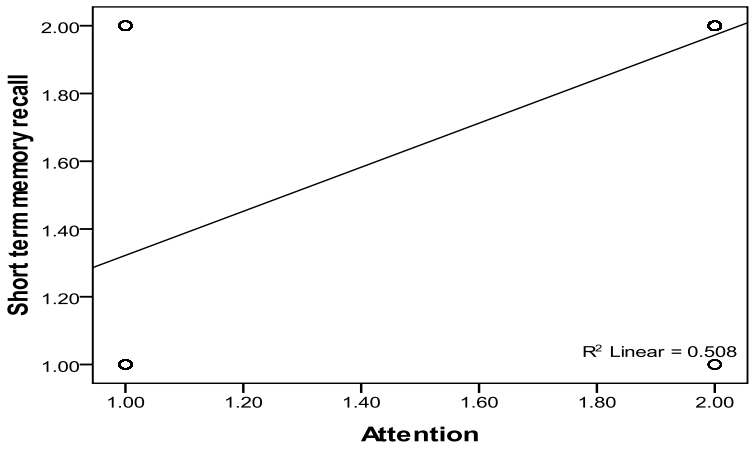


Figure 12. Direction of correlation between attention and short memory recall

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The mean number of paid attentional efforts at these memory recall paradigms was 1.66 (SD= .47) and short-term memory recall had a mean quality rating of 1.75 (SD= .43). Pearson's correlation supported the hypothesis that there would be linear relationship between these two variables, $r = .713$, $p < 0.01$.

To conclude, the value of R is 0.713. This is a moderate positive correlation, which means there is a tendency for high X variable scores go with high Y variable scores (and vice versa). The value of R2, the coefficient of determination, is 0.508. The P-Value is < 0.00001. The result is significant at $p < 0.01$.

DISCUSSION

The results of the current study were to a great extent in agreement with our early expectations. We proposed two hypotheses examining the effect of attention on short-term memory recall of Arabic abstract and concrete words using free, cued, and serial recall paradigms. The final answers of these two claims are presented below in relation to the introductory part, presented theories and statistical analysis.

First, we wanted to know whether attention affects short-term memory recall or not. For that matter, we proposed a hypothesis that included three minor claims. To start with the first two points we proposed that the number of recalled words increases when less attentional efforts and/or the number of recalled words decreases when more attentional efforts are paid where our presented statistical analysis indicated generally that such a claim is seemingly true. That is to say it was realized in some tasks but not in the others. In detail, during both free and serial recall paradigms, the results indicated increase in number of recalled words other than decrease when accompanied by less attentional efforts. The percentages of the recalled free and serial words were (50% and 12%) in the experimental group with low attentional efforts as compared to only (47% and 6%) in the control group with high attentional efforts. On the other hand, the effect of attention was not clear during cued recall paradigms where the number of the recalled words increased other than going down when more attentional efforts were paid. The percentage of the recalled words during cued recall paradigms was (47%) for the control group and only (38%) for the experimental group.

We attribute what happened in the case of free recall paradigms to the fact that the performance of the experimental was better than the performance of the control group. In other words, since attention is the tested variable so during free recall the two groups were still even in terms of attention level. In such a case; however, it was normal that a group would excel the other. Again, in the case of serial recall, this could be interpreted in terms of learning enhancement and concentration. To make it clear, we think the reason why the students who paid less attentional efforts (fatigue) were able to retrieve more words serially than the students who paid more attentional efforts because it seems that the prior learning tasks (free recall and cued recall paradigms) have resulted in the activation of certain areas in the brain including the memory which has resulted to faster recall processes. We assume that the retrieval of fewer words during cued recall paradigms by the experimental group which were supposed to retrieve more words than those recalled by the control group is due to the use of cues. Say it differently, since another factor (motivation) from among the factors that affect memory has indirectly integrated with the tested factor (attention) so this has resulted in an unexpected change in the results.

We also proposed that abstract words are better recalled than concrete ones during free, cued and serial recall paradigms be it with more or less attentional efforts. The statistical analysis of our collected data indicated the consolidation of this minor claim. In other words, it was

ISSN: 2307-3721, e ISSN: 2307-3713

very clear from the results that the number of the recalled abstract and concrete words was nearly relative. To that extent, one could say that there was neither an abstractness effect (more recalled abstract words than the concrete ones) nor a concreteness effect (less recalled abstract words than the concrete ones). It was, instead, a zero effect, that is, similar number of recalled abstract and concrete words with statistically yet noticeably insignificant differences.

Second, we hypothesized that there might be a (correlation) between attention and short-term memory recall of Arabic abstract and concrete words during free, cued and serial recall paradigms. The statistical analysis revealed clearly that there was a positive correlation between the two variables, $r = 0.713$, $n = 440$, $p = 0.000$, with $R2 = .508$. In other words, there was a moderate, positive correlation between attentional efforts (the independent variable) and short-memory recall (the dependent variable). Increases in paid attentional efforts were correlated with increases in non-retrievable Arabic abstract and concrete words (short-term memory recall) and vice versa.

Our reached results are to a great extent in agreement to those revealed in studies conducted by (Pimentel & Albuquerque, 2013; Hertel, Benbow, & Geraerts, 2012; Cao, 2012; Yamagishi, Sato, & Sato, 2012; Mandler's study as cited in MacLeod & Kampe, 1996; Mulligan, 1998; Rajaram, Srinvas & Travers, 2001; Carou, Redondo, & Pineiro, 2011).

CONCLUSIONS

In this study, we introduced one of the memory processes, namely, recall in relation to one of the factors that affect memory recall, mainly, attention. We specifically examined the effect of attention on short-term memory recall of Arabic abstract and concrete words using free, cued, and serial recall paradigms. We used a four group quasi-experimental randomized design where one group consisting of 9 students was referred to as the experimental group and three groups were dealt as the control group. The independent variable was the paid attentional efforts—represented by performing sequential yet subsequent recall paradigms (free, cued and then serial). On the other hand, the dependent variable was the number of recalled abstract and concrete words in low and moderate attention group(s) and the high attention group. Thus, we came to the conclusion that attention affects word memory recall where used measures indicated that the number of recalled words increases when less attentional efforts are paid. Conversely, the number of recalled words decreases when more attentional efforts are paid. Furthermore, abstract words are not better recalled than concrete ones in free, cued and serial recall paradigms be it with more or less attentional efforts. Lastly, there was a clearly noticed (correlation) between attention and short-term memory recall of Arabic abstract and concrete words. Say it differently; there was a moderate, positive correlation between attentional efforts and short-memory recall. Increases in paid attentional efforts were correlated with increases in non-retrievable Arabic abstract and concrete words (short-term memory recall) and vice versa.

IMPLICATIONS

This study has two implications: one is pedagogical and another is cognitive. To start with the pedagogical one, one of the basic purposes of learning is increasing the level of knowledge. In the case of vocabulary, for instance, teachers intend to increase the lexicon capacity of their learners as do learners wish to increase both the acquired and learned number of lexical items. According to the reached results in our study, attention does affect the recall of words. This indicates that teachers should consider the paid attentional effort when teaching and introducing vocabulary to their learners. Additionally, the variable differences between recalled the words due to the use of different recall paradigms, i.e. free, cued and serial recall have to be considered in the sense that a certain task might be more effective than the other.

ISSN: 2307-3721, e ISSN: 2307-3713

To move to the second implication, namely the cognitive one, our results indicated the more paid attentional efforts are the less recalled word will be. On the other hand, the less paid attentional efforts are, the more recalled words will be. One could assume that short-term memory seems to have limited capacity in the sense of abstract and concrete words recall.

LIMITATIONS AND FUTURE WORK

This study has one limitation related to research methodology, mainly delimitation of the study. We have introduced in the introductory part that there are a number of types for attention: selective, sustained, alternating, dividing, automatic, controlled, auditory and visual. This aspect has not been considered and accounted for during the conducted experiment examining the correlation between attention and short-term memory recall. Further research should take into account this above point in addition to the other factors which could affect short-term memory recall. The factors which could affect short-term memory recall include: motivation, interference, context, state-dependent memory, gender, food consumption, physical activity and trauma and brain exposure.

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Appendix

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Group ( ) Classification of abstract and concrete words Participant ( )

Note: This form is used to classify abstract and concrete words

Instructions:

1. Write:

A. No. (1) in the first column if the word has a concrete meaning

B. No. (3) in the first column if the word does not have a concrete meaning

C. No. (2) in the first column if you think that the word can have a concrete meaning, but you are not sure

2. Write:

A. No. (1) in the second column if you can imagine a clear picture of the word in your imagination

B. No. (3) in the second column if you cannot imagine any clear picture of the word in your imagination

C. No. (2) in the second column if you think that you can imagine but the word does not seem to have a clear picture to be imagined.

3. Write:

A. No. (1) in the third column if you think that the word has a clear meaning without any difficulty.

B. No. (3) in the third column if you think that the word does not have a clear meaning and may have a complex meaning and it is not easy to recall.

C. No. (2) in the third column if you think that the word looks simple and at the same time complex and difficult to understand.

4. Write:

A. Try to remember the year during your life time where you think you acquire the word.

Note: Acquisition here means the first time in your life you feel that you can practice using the word.

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Classification Form

Characteristics of Classification				***List of Words***
Age of Acquisition	*Imageability*	*Meaningfulness*	*Concreteness*	*The Word*
				Inspiration
				Human
				Insight
				Data
				Body
				Jinn
				Paradise
				Brain
				Spirit
				Poet
				Charity
				Conscience
				Torment
				Mind
				Eyes
				heart
				Computer
				Money
				Fire
				Happiness

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Free recall) Group (A)

Note:
This form is used to record the oral recall (Please use here the five non-shaded words only).

Observed Effect		***List of Words***	
Recency Effect	*Primacy Effect*	*Abstract Words*	*Concrete Words*
		Jinn ◯	Human ◯
		Spirit ◯	Body ◯
		Fire ◯	Paradise ◯
		Mind ◯	Brain ◯
		Inspiration ◯	Poet ◯
		Insight ◯	Eyes ◯
		Conscience ◯	Heart ◯
		Data ◯	Computer ◯
		Charity ◯	Money ◯
		Torment ◯	Hell fire ◯
		Total recalled words	Total recalled words

Instructions:

1. Please write in order the number of words that were recalled by the student. If the student remembers the next word or the word next to it, then, write the number in order. For example, if the student remembers the first word (heart) write (1) in the oval circle. If it is the second word (fire), write (2) in the oval circle and so on. Do not write anything for words that cannot be remembered by the student and leave the oval circle blank to mean that the student did not remember those word(s) within the list of words.

ISSN: 2307-3721, e ISSN: 2307-3713

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Free recall) Group (A)

Note: This form is used to record recall by writing. (Please, use here the non-shaded five words only).

Observed Effect		***List of Words***	
Recency Effect	*Primacy Effect*	*Abstract Words*	*Concrete Words*
		.....	.....
		.....	.....
		.....	.....
		.....	.....
		.....	.....
		Insight	Eyes
		Conscience	Heart
		Data	Computer
		Charity	Money
		torment	Hell fire
		Total recalled words	Total recalled words

Instructions:

1. Please mark the words that you can remember in the blanks, and do not write anything inside the oval circles. If you cannot remember the next word, then, write the word next to the word which you can remember.
2. Please, do not write anything in the third and fourth columns.

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Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Cued recall) Group (2)

Note: This form is used to record oral recall

Aids To Remember		***List of Words***	
Semantic Association	*First Letter*	*Abstract words*	*Concrete words*
Poem	[Sh]	Inspiration	Poet
Point to your eyes	[b]	prevision	Eyes
Move your hand as if you are printing.	[k]	Data	Computer
Satan	[j]	Jinn	Human
Point your hands to your body.	[g]	Spirit	body
Move your hands as if you are having your food.	[s]	Charity	Money
Move your fingers to mime heartbeat	[q]	Conscience	Heart
Imitate and or pretend suffering feelings	[aa]	agony	Fire
Point your finger to your head as if you are thinking.	[d]	Mind	Brain
Imitates alternative torch fire	[n]	Hell fire	paradise
		Total recalled words	Total recalled words

Instructions:

1. Please mark (√) the word that the student can remember or mark (×) to the word, which the student could not remember.
2. Please mark (√) to the assistance aid that you gave to the student. If the student was able to remember the opposite word without any means of help, then do not do anything in the third and fourth columns either if they do not remember the opposite word even using assistance aids. Place the sign (×) on each. If the student can remember the word using the first assistance aids, place the mark (√) and let the second blank. But if the student could not remember the first assistance, place the mark (×) and on the second (√) if the student was able to remember to use or (×) if the student could not remember them.

ISSN: 2307-3721, e ISSN: 2307-3713

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Cued recall) Group (2)

Note: This form is used to record oral recall

Aids to Remember		***List of Words***	
Semantic Association	*First Letter*	*Abstract Words*	*Concrete Words*
Poem	[Sh]	Inspiration	Poet
Point to your eyes	[b]	prevision	Eyes
Move your hand as if you are printing.	[k]	Data	Computer
Satan	[j]	Jinn	Human
Point your hands to your body.	[g]	Spirit	body
Move your hands as if you are having your food.	[s]	Charity	Money
Move your fingers to mime heartbeat	[q]	Conscience	Heart
Imitate and or pretend suffering feelings	[aa]	agony	Fire
Point your finger to your head as if you are thinking.	[d]	Mind	Brain
Imitates alternative torch fire	[n]	Hell fire	paradise
		Total recalled words	Total recalled words

Instruction:

1. Please write the words that you can remember in the blanks, and do not write anything inside the oval circles. If you cannot remember the word, use the helping aids available to you (the first letter or the semantic association), which will be provided by the person who runs the research process.
2. Please, do not write anything in the third and fourth columns unless you are using any of the means of help to remember the word(s) you want. In case you did that, you must check (□) in the event of using the first help, and helped you to remember the word, or check (×) in the event of using the first help and did not help you to remember the word.

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3. Follow the same steps to deal with the helping aids in the fourth column (semantic association).

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Serial recall) Group (3)

Note:

This form is used to monitor the oral remembering (Please use here the five non-shaded words only).

Aids to Remember		***List of Words***			
Initial Letter	*Initial Letter*	*Abstract Words*		*Concrete Words*	
		Jinn		Human	
		Spirit		Body	
		Hell		Paradise	
		Mind		Brain	
		Inspiration		Poet	
		Insight		Eyes	
		Conscience		Heart	
		Data		Computer	
		Charity		Money	
		Agony		Fire	
		Total recalled words		Total recalled words	

Instructions:

1. Please write the words in sequence in each of the first and second columns
2. In case you cannot remember all the words or the next word, just write what you can remember.
3. Do not write anything in the second and third columns

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Important Note:

This table is to be filled out by the researcher. Please do not write anything in this page.

Observed Effects							
List Length	*Primacy And Recency Effects*	*Transposition Gradients*	*Item Confusion*	*Repetition Errors*	*Fill In Effects*	*Protrusion Effects*	*Word Length*

Instructions for the Observed Effect:

1. Do not write anything in the first column;
2. Do not write anything in the second column as well;
3. Suppose that the student remembers every word in the first and second in sequence, then remembers another word instead of the third word – for example the fourth or fifth, please write number (3) on the word uttered by the student;
4. Suppose that the student remembers each the first words in sequence and then remembers another similar word and second instead of the third word – (for example, the word **paradise** in terms of the similarity in semantic meaning or the word jinn in terms of the similarity in sound, write number (4) on word uttered by the student;
5. Suppose that the student remembers each of the first and second words in sequence and then remembers the second word again instead of the third word or any other word uttered before within the same list, please write number (5) on the word uttered by the student;
6. Suppose that the student remembers each of the first and second words in sequence and then remembers another word instead of the third (for example, the fourth word, but not the fifth or any other word to come), please write number (6) on the word uttered by the student;
7. Suppose that the student remembers each of the first and second words in sequence and then remembers another word which is not in the list of words to be remembered instead of the third word (For example, he remembers a word from the list of abstract words for concrete words or just the opposite), please write number (7) on the word uttered by the student;
8. Do not write anything in the eighth column.

ISSN: 2307-3721, e ISSN: 2307-3713

Examining Effect of Attention on Short-term Memory Recall of Arabic Abstract and Concrete Words Using Free, Cued, and Serial Recall Paradigms

Participant (1) (Serial recall) Group (3)

Note:
This form is used to monitor the recall by writing (Please use here the five non-shaded words only).

Aids To Remember		***List of Words***			
Initial Letter	*Initial Letter*	*Abstract Words*		*Concrete Words*	
		Jinn		Human	
		Spirit		Body	
		Hell		Paradise	
		Mind		Brain	
		Inspiration		Poet	
		Insight		Eyes	
		Conscience		Heart	
		Data		Computer	
		Charity		Money	
		Agony		Fire	
		Total recalled words		Total recalled words	

Instructions:

1. Please write the words in sequence in each of the first and second columns
2. In case you cannot remember all the words or the next word, just write what you can remember.
3. Do not write anything in the second and third columns

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Important Note:

This table is to be filled out by the researcher. Please do not write anything in this page.

Observed Effects							
List Length	*Primacy And Recency Effects*	*Transposition Gradients*	*Item Confusion*	*Repetition Errors*	*Fill In Effects*	*Protrusion Effects*	*Word Length*

Instructions for the Observed Effect:

1. Do not write anything in the first column;
2. Do not write anything in the second column as well;
3. Suppose that the student remembers every word in the first and second in sequence, then remembers another word instead of the third word – for example the fourth or fifth, please write number (3) on the word uttered by the student;
4. Suppose that the student remembers each the first words in sequence and then remembers another similar word and second instead of the third word – (for example, the word **paradise** in terms of the similarity in semantic meaning or the word jinn in terms of the similarity in sound, write number (4) on word uttered by the student;
5. Suppose that the student remembers each of the first and second words in sequence and then remembers the second word again instead of the third word or any other word uttered before within the same list, please write number (5) on the word uttered by the student;
6. Suppose that the student remembers each of the first and second words in sequence and then remembers another word instead of the third (for example, the fourth word, but not the fifth or any other word to come), please write number (6) on the word uttered by the student;
7. Suppose that the student remembers each of the first and second words in sequence and then remembers another word which is not in the list of words to be remembered instead of the third word (For example, he remembers a word from the list of abstract words for concrete words or just the opposite), please write number (7) on the word uttered by the student;
8. Do not write anything in the eighth column.

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