RESEARCH PAPER | Social Science | Volume : 5 | Issue : 11 | November 2015 | ISSN - 2249-555X

On Arabic Abstract and Concrete Words Recall Using Free, Cued, and Serial Recall Paradigms: Is It Abstractness, Concreteness, or Zero Effect?

KEYWORDS: Abstract words; Concrete words; Free recall; Cued recall; Serial recall; Recall effects; Abstractness effect; Concreteness effect; Zero effect.

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ABSTRACT

Purpose: *To see in which type of recall more words are recalled, to see whether abstract or concrete words are better recalled in each yet which type of recall, and to see if there are any differences between types of recall that would affect recall of abstract words over concrete ones or vice versa.*

Methods: *Three groups of undergraduates in King Saud University, Saudi Arabia participated in this study where they were trained to differentiate between abstract and concrete words. A list of 20 Arabic abstract and concrete words was then given to them to be classified into abstract and concrete words based on four factors: concreteness, imageability, meaningfulness, and age of acquisition. An observation sheet was provided to the experiment administrator to document observed recall effects and recalled words. Three methods were used to facilitate this experiment: auditory, visual, and hand-writing methods. The students were asked to perform three types of recall: free recall for group 1, cued recall for group 2, and serial recall for group 3. Five of the participants were asked to recall freely and serially only 5 Arabic abstract words and 5 concrete and 4 were asked to to recall freely and serially the 20 Arabic abstract and concrete words. For cued recall, the whole group participants were required to recall the whole list.*

Results: *Both referential and descriptive statistical tools were run to analyse the collected data and answer the questions of the current study. Run referential statistical tools approved the usability of the designed measures. Descriptive statistical tools revealed that the participants in the free recall group remembered all words in the 20 list, 10 list, abstract and concrete ones. In the cued recall group, they remembered the over majority of the words in the case of concrete ones but all the abstract ones. Again, for the serial recall group, they remembered only few words be it in the case of short list, long list, abstract or concrete with more remembered words in the case of abstract words. Zero effect was the most frequent effect among the three groups (free recall= 100, cued recall= 98.5 and serial recall= 82.3). Two effects were observed in free recall: (primacy effect: 35% and recency effect= 65%). For cued recall, two effects were observed also: (forward recall: 51% and backward recall: 49%). For serial recall, 9 effects were pre-specified and only 5 were observed: (transposition gradients effect= 100, primacy effect= 30, recency effect= 70, list length effect= over 17 and fill-in effect= over 16).*

Conclusions: *Our results indicated that abstract and concrete words are better recalled in free recall paradigms than in cued and serial recall paradigms. Yet, words are more poorly and considerably recalled in serial recall than in both free and cued recall paradigms. There was also neither an advantage of concrete words over abstract ones nor for abstract words over concrete ones albeit insignificant statistical difference was calculated in the case of cued and serial recall paradigms in favour of abstractness effect. Finally, while recency effect is more frequent than primacy effect during free recall paradigms, both forward and backward recall effects are similar to one another in frequency level during cued recall paradigms. Transposition gradients effect is the most frequent observed effect during serial recall paradigms among the possible types of effects.*

Introduction

Semantically, words could be studied in terms of either abstract or concrete ones. Abstract words refer to 'words that are not directly correlated with an image…words which would not immediately bring an image to the mind when heard', (Psychology Dictionary, 2012). They, abstract words, refer to 'feelings such as instincts or anxiety are widely understood even though there is no real way to physically display them for description', (ibid). Concrete words, on the hand, refer to situations where 'a word is connotating a tangibly authentic and perceptible being, like a car or house', (ibid). They are, concrete words, 'commonly referenced in popular children's television shows as a way to instill an image in the child's mind with the utterance of the word', (ibid). (Landry, 2009) states that 'abstract comes from the Latin, meaning "removed from", or moved from concrete reality', (p. 1). (Friedlander, 2013) introduces abstract and concrete words distinguishingly as 'abstract terms [words] refer to ideas or concepts; they have no physical referents' while 'concrete terms [words] refer to objects or events that are available to the senses', (pp. 1-2).

In fact, different theories, hypotheses, and/or models have been proposed studying the difference between abstract and concrete words be it in terms of processing, acquisition, comprehension, production, or even dissolution. Among these are: *dual coding theory* (see Paivio, 1990), *context availability hypothesis* (see Schwanenflugel, Akin, & Luh, 1992), *automatic imagery hypothesis* and *strategic imagery hypothesis* (ibid).

Within the study of differences between abstract and concrete words, concreteness effect has been greatly and widely explored. Concreteness effect refers to the belief that concrete words have an advantage over abstract words in the sense of that abstract words are remembered more poorly than the concrete ones. A number of the studies regarding this issue are presented briefly below. On the contrary, an opposing term to the the concreteness

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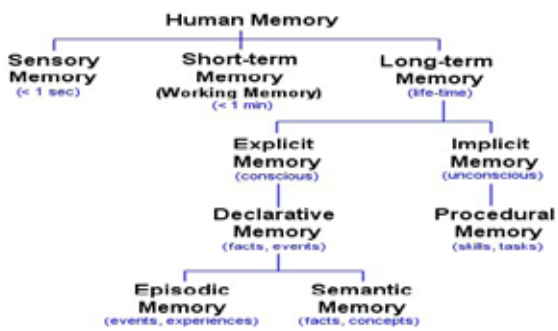
effect which is introduced in this study is [abstractness effect]. Abstractness effect in this study is proposed to refer to and argue that there is a possible advantage of abstract words over concrete ones other than the claim that there is an advantage of concrete words over the abstract ones in terms of better recall and processing. Moreover, we introduced the term [zero effect] to refer to the situation where the number of the recalled abstract words and recalled concrete words is even.

To explore the issue of words recall, it is worth to introduce human memory. Memory is referred to 'our ability to encode, store, retain and subsequently recall information and past experiences in the human brain', (Mastin, 2010). It is also 'the sum total of what we remember, and gives us the capability to learn and adapt from previous experiences as well as to build relationships', (ibid). The word memory is a general term used in different sciences and fields but mainly in psychology and neurosciences. (Markowitsch, 2014) indicates that 'it implies the storage of ontogenetically acquired information in neuronal structures so that it may be recalled in the future'.

Actually, human memory can be studied in terms of different types. Consider for instance the model introduced by (Mastin, 2010) where sensory memory, short-term memory and long-term memory are the three major types of human memory. Long-term memory among the three memory types is then divided into sub-types and minor-types as illustrated in figure 1 below.

Figure 1: Luke Mastin (2010) diagram for types of memory



Furthermore, within the study of memory, there are three processes. (Ono, 2014) states that 'memory sometimes refers to an engram (i.e., memory trace) that is acquired by learning, and is formed and processed through encoding, storage, and retrieval of information'. (Ono, 2014) presents these three processes comparatively yet briefly as 'encoding refers to the initial acquisition of information, storage is the retention of encoded information over time, and retrieval refers to the processes involved in using stored information…breakdown in one of these stages can intervene in a successful recall ' of gained 'information' and/or knowledge. In comparison, (Mastin, 2010) introduced four processes for human memory: encoding, consolidation, storage, and recall/retrieval.

The last process (recall and/or retrieval) which is the concern of this paper is referred to as 'the subsequent re-accessing of events or information from the past, which have been previously encoded and stored in the brain. In common parlance, it is known as remembering', (Mastin, 2010). What happens during recall is that human brain 'replays a pattern of neural activity that was originally generated in response to a particular event, echoing the brain's perception of the real event'. He continues that 'there is no real solid distinction between the act of remembering and the act of thinking', (Mastin, 2010).

In detail, there are mainly three types of recall: free, cued and serial recall. To start with free recall, it refers to 'the process in which a person is given a list of items to remember and then is asked to recall them in any order', (Mastin, 2010). This type of recall shows two types of effects: primacy effect 'when the person recalls items presented at the beginning of the list earlier and more often' and recency effect 'when the person recalls items presented at the end of the list earlier and more often', (ibid). Unlike free recall, cued recall refers to 'the process in which a person is given a list of items to remember and is then tested with the use of cues or guides' (ibid). Furthermore, 'when cues are provided to a person, they tend to remember items on the list that they did not originally recall without a cue, and which were thought to be lost to memory', (ibid). Dissimilar to free recall and cued recall is serial recall which refers to human's capability to 'recall items or events in the order in which they occurred, whether chronological events in our autobiographical memories, or the order of the different parts of a sentence (or phonemes in a word) in order to make sense of them', (ibid).

To return to abstract and concrete words recall, several studies have been conducted investigating concreteness effect or the advantage of concrete words over abstract ones in terms of retrieval. Consider, for instance, (Harad's & Coch, 2009) who investigated the concreteness effect on the ability of processing words and backward recall. 14 normal adults participated in the study where 120 abstract words and 120 concrete words were used. It should be noted that 60 words from each type were old and 60 words were considered as new. Memory tasks including press button judgment were used as tools of this research. It was concluded that concrete word are more remembered than abstract ones. The researchers supported their empirical conclusion stating that concrete words have more "meaning-based features" than do have the abstract ones, (Walker & Hulme, 1999 in Harad& Coch, 2009, p. 1; Walker and Hulme, 1999).

Consider, also, (Schwa's, Akin, & Luh, 1992) who examined the concreteness effects of *automatic-imagery*, *strategic-imagery*, and *context availability hypothesis* predictions to recall abstract and concrete words. The researchers conducted three experiments supporting the view that abstract words "are remembered more poorly than concrete materials", (Paivio in Schwa, Akin, & Luh, 1992, p. 96). The researchers concluded their research with results supporting the "strategic-imagery view of concreteness effects in free recall", (ibid).

Again, (West & Holcomb, 2000) 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 three groups where each group represented 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.

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Furthermore, (Duñabeitia, Avilés, Afonso, Scheepers, & Carreiras, 2008) conducted a research about the representation of abstract and concrete words where in this topic was investigated 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 words are recognized and represented in terms of semantic associations and concrete ones are represented in terms of semantic similarity. (Crutch & Warrington, 2005, p. 623) propose 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 naïve 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.

Similarly, (Fliessbach, Weis, & Klaver, 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 posses "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 posses "a more accessible semantic network", (Fliessbach et al., 2006, p. 1413). The researchers made use of the even-related functional magnetic resonance imaging (fMRI) technique as a tool for testing their proposed prediction. 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.

Once again, (Borghi,, Flumini, & Cimatti, 2011) conducted four experiments investigating possible differences between the acquisition of abstract and concrete words. 60 students in experiment 1, 32 in experiment 2, 18 in experiment 3, and 18 in experiment 4 who were native Italian speakers participated in the study. The researchers used 3D figures of novel objects and related new labels as material of the study. The researchers were able to identify a number of certain characteristics associated with the acquisition of abstract and concrete words. Among these findings is that those observed characteristics were typical for the abstract words but not for the concrete ones. Besides, the researchers stated that abstract words are non-manipulable though recognizable.

Likewise, (Mestres-Misse´, Mu¨nte, & Rodriguez-Fornells, 2008), examined the contextual acquisition of abstract and concrete words using a functional neuroanatomy approach and/or technique. Fifteen native Spanish speakers with no neurological or psychiatric history participated in the study where 80 abstract words and 80 concrete words structured in paired sentences were used as material of the study. The tool of the study was fMRI. Results indicated different qualitative revealed associations for the learned abstract and concrete words.

(Dahlstrom & Ultis, 2014) also 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].

Additionally, (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.

In addition, (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.

Once more, (Wiemer-Hastings, 2005) compared the content of abstract and concrete concepts in terms of conceptual representation and processing and more specifically conceptual properties of abstract and concrete concepts. 31 subjects participated in the study where 18 abstract and 18 concrete concepts were used for the purpose of comparison. The researcher presented an evidence that "abstract concepts involve qualitatively different types of properties from concrete concepts", (Wiemer-Hastings, 2005, p. 731). Besides, abstract concepts are more associated with subject experiences and evens in our day-to-day lives and more importantly generating abstract words or characteristics for abstract concepts seems to be more difficult and/or complex than that for the concrete ones.

Besides, (Ise & Altarriba, 2009) assessed the roles of word concreteness and word valence in immediate serial recall. The researchers conducted two experiments using word-label and word-laden pairs of words. Five lists of positive concrete words, five lists of negative concrete words, five lists of positive abstract words, and five lists of negative abstract words were used in the first experiment. In the second experiment, the researchers used five lists of neutral abstract words and five lists of neural concrete words plus the twenty lists used in experiment 1. The participants were 20 in Experiment 1 and 20 in Experiment 2 who were native-speaker of English Language. A compatible computer with E-Prime was used for data-analysis purposes. Results indicated that concrete words are more recalled than abstract ones, yet positive ones are more recalled than negative ones. These results are also the same in the second experiment in addition to that positive and neutral words are more remembered than negative words.

Moreover, Immediate Serial Recall (ISR) in terms of forward recall and backward recall of abstract and concrete words affected by word length and age was examined by (Baker,

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Tehan, & Tehan, 2012). The study was based on the assumption that words of short lists are better recalled than words of long lists. More importantly, the study raises the importance of backward recall and age influences on word recall. Two experiments were conducted and 20 different participants were included in each. 20 short words and 20 long words were drawn from the (MRC) Psycholinguistic Database. Reached conclusions included but not limited to that: 1) age effects are weaker when forward recall is required, 2) no age effects in recognition, and 3) pattern of word length effects is similar for both younger and older participants.

Furthermore, (Lagishetti & Goswami, 2012) conducted a study examining the effectiveness of concreteness on differentiating between abstract and concrete words processing. A minor aim of this study was also observing any gender differences in relation to abstract and concrete words processing. The participants were 20 neuro-typical adults (10 males and 10 females) whose first language is Kannada Language. The instrument of the study was DMDX software and an accompanying software called (TimeDX). The researchers made use of 100 selected abstract and concrete words measured on 3-point scale (1: abstract, 2: unrecognized, 3: concrete). Reaction times for both abstract and concrete words were measured and results revealed significant differences between occurring reaction times for abstract and concrete words in favour of the concrete ones. Gender differences were not observed during the study and the researchers concluded that concreteness is an effective variable for distinguishing between abstract and concrete words processing.

One more study is that by (Hanley, Hunt, & Steed, 2013) who examined concreteness effect on abstract and concrete words' production. Two experiments were conducted where in 56 undergraduates from the University of Essex participated in Experiment 1 and 58 participated in Experiment 2. 68 words where 34 are abstract and 34 are concrete with their dictionary definitions were used to measure the productions of the words in terms of semantic lexical weighs and phonological lexical weighs. Findings indicated that "poor performance during attempts to retrieve abstract words from their dictionary definitions… associated with more omissions, more alternates, and more tip-of-the-tongue-state (TOTs) than is the case for concrete words", (p. 374).

Finally, (Marques & Nunes, 2012) assessed contributions of language and experience to the representation of abstract and concrete words. The researchers made two studies where study 1 consisted of rating 47 highly abstract and 47 highly concrete words and in study 2-35 English native speakers participated with the same data using E-prime software. Findings indicated that "language associations are more important for abstract concepts than for concrete concepts", (p. 1273) and "… semantically similar associates are more activated for abstract concepts than for concrete concepts and are also less activated than semantic associates for this last instance", (ibid). On the basis of the above studies, it can be clearly seen that studies accounting for recall types from the angel of abstractness effect and/or zero effect have not been conducted. For that matter, in this study we attempted answering the following two questions:

In which type of recall type (free, cued, and serial) more words are recalled and more importantly which are remembered more poorly and which are remembered more strongly-abstract or concrete words-abstractness effect or concreteness effect?

What are the observed differences among the effects in each recall type:

Primacy and recency in free recall;

Forward and backward recall in cued recall; and

1) list length effect, 2) primacy and recency effects, 3) transposition gradients effect, 4) item confusion errors effect, 5) repetition errors effect, 6) fill-in effect, 7) protrusion effect and 8) word length effect in serial recall.

Method

Sample

The population of interest in this study was all university students in the undergraduate level who met 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 (1) 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, Najdi
Ethnicity	Arabs, 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. 27 students were randomly selected from the the class which has 36 students from the College of Engineering who were enrolled in prerequisite English Language course in the College of Languages and Translation, King Saud University, Riyadh, Kingdom of Saudi Arabia in February, 2014.

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.

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 associa-

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tions 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 was selected to measure abstract and concrete words recall through free call, cued recall and serial tasks. The words are also expected to allow observing different recall effects and/or factors in each recall type that would support the view either abstract words are more recalled than concrete ones or vice versa. The following table (2) shows the intended effects and/or factors. The list of the words, yet more procedural issues could be followed in the procedures section below and in the appendix.

Table 2: Intended observed effects during free, cued and serial recall tasks

Recall type	Intended observed effect	Intended observed factor
Free recall	Primacy effect	
	Recency effect	
Cued recall		Forward recall
		Backward recall
Serial recall	List length effect	
	Primacy and recency effects	
	Transposition gradients effect	
	Item confusion errors	
	Repetition errors	
	Fill-in effects	
	Protrusion effects	
	Word-length effects	

Both validity and reliability were calculated in these used measurement tools. 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 researchers 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 word 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 the 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	
	Tool	**Result**		**Tool**	**Result**
Inter-rater	Pearson	.80, .80, .78	Face	2 raters	High
Internal	Cronbach	.82	Content	Categories	Excellent
			Predictive	Pearson	.49
			Concurrent	Uncalculated	
			Convergent	Uncalculated	
			Discriminant	Uncalculated	

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 three-group non-experimental randomized design was used in this study. The design can be depicted in notational form as:

$R \quad X^{-}_{1,2,3} \qquad O_{1,2} \qquad O_{1,2}$

$R \quad X^{-}_{1,2,3} \qquad O_{1,2} \qquad O_{1,2}$

$R \quad X^{-}_{1,2,3} \qquad O_{1,2,3,4,5,6,7,8,9} \qquad O_{1,2}$

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 and the lower case numbers stand for the possible observed effects/factors in each recall type (2 effects in free recall, 2 factors in cued recall and 8 effects in serial recall)

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

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lower case stand for (1 = abstract words, and 2 = concrete words)

Two groups were split into two small groups where 4 were requested to recall 10 abstract and 10 concrete words and 5 were requested to recall only 5 abstract and 5 concrete words in both free and serial recall paradigms only. That is to say, in the cued recall paradigms, the students were assigned to recall the whole list of words since both forward and backward recall tests were used interchangeably. The purpose was to compare and measure occurring recall effects/factors and see which words are better recalled, that is abstract or concrete words in each recall type-abstractness or concreteness effect.

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 were 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:

- Auditory methods: the administrator of the research reads the words aloud to the students;
- Visual method: the administrator of the research presents the list of words to the students 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
- 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.

Trial one attempted only free recall; observing
- Primacy effect, and
- Recency effect

Trial two attempted only cued recall; observing
- **Forward recall, and**
- **Backward recall**

Trial three attempted only serial recall; observing
- List length effect
- Primacy and recency effects
- Transposition gradients
- Item confusion errors
- Repetition errors
- Fill-in effects
- Protrusion effects
- Word-length effects

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 were assured to have full 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 a comfortable chair, over-head projector, good air conditioning, and lightening. The used time for all the above described steps to be performed was about 26 minutes for each recall type (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:

- 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;
- The administrator of the research collects the words' lists from the students;
- The administrator of the test makes sure that none of the students has any words lists remaining with them;

- The administrator of the test reads the list of words aloud (abstract-concrete or concrete-abstract) to the students;

- The students are requested to say the words which they can recall;

- The administrator of the research documents the recalled words in both cases; and
- The administrator of the research also documents the observed required recall effects (two during free recall, two during cued recall and nine during serial recall).

The administrator of the research presents the words to the students using an over-head projector (OHP) requesting them to:

Read them silently;

Read them either aloud, finger pointing or lips-moving; and finally

Write them down

- 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) did the calculations for the following:

Observed effects; and

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Number of recalled abstract words as opposed to number of recalled concrete ones for the three recall types.

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

Preliminary analysis steps: Using the 17th version of SPSS (Statistical Package for Social Sciences), both descriptive and referential statistical 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 tools and performed functions. Our proposed hypotheses in this study were:

In which type of recall (free, cued, and serial) more words are recalled and more importantly which are remembered more poorly and which are remembered more strongly-abstract or concrete words-abstractness effect or concreteness effect?

What are the observed differences among the effects in each recall type:

Primacy and recency in free recall;

Forward and backward recall in cued recall; and

1) list length effect, 2) primacy and recency effects, 3) transposition gradients, 4) item confusion errors, 5) repetition errors, 6) fill-in effects, 7) protrusion effects, and 8) word length effects in serial recall.

Table 6: Summary of the statistical tools used in analyzing 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

There were 27 participants in this study divided into three groups, 9 each, each of which performed a certain recall type: free recall paradigms, cued recall paradigms and serial recall paradigms, respectively. Descriptive statistical tools were run to either accept or reject the above proposed hypotheses.

The percentages of total recalled words for the three groups are shown in figure 2 below.

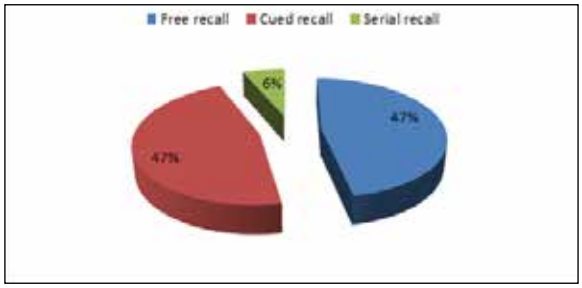

Figure 2: Percentages of total number of recalled words in free, cued, and serial recall paradigms

The above figure presents the percentages of the total recalled Arabic abstract and concrete words for three groups. The first group performed free recall paradigms, the second group performed cued recall paradigms and the third group performed serial recall paradigms. This pie chart could be read counterclockwise. The percentage of the total recalled Arabic abstract and concrete words in free recall is exactly the same as the total number of recalled Arabic abstract and concrete words in cued recall (47% for each). The least percentage for recalled Arabic abstract and concrete words is for serial recall paradigms (6%). This means that the number of serially recalled words is significantly less the the number of recalled words in free and cued recall paradigms. There were no differences between the number of recalled words freely and with cues. By this means, this very early statistics gives us an early indication that the students who participated in both free and cued recall paradigms performed noticeably better than those who participated in serial recall paradigms.

Detailed statistical results for the recalled number of words in the three types of recall for the three participating groups are shown in figure 3 below.

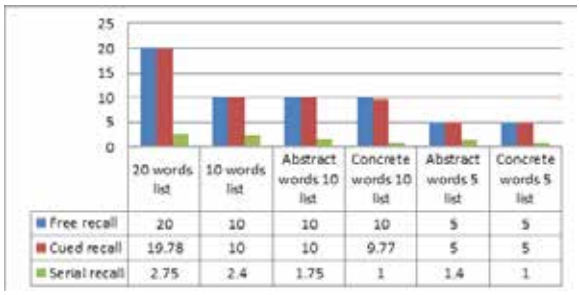

Figure 3: Comparison of recalled words in different performed tasks of free, cued, and serial recall paradigms

The presented statistical results in the above given figure confirm the earlier presented results in figure 2. It is very clear the whole number of words be it in the 20 list, 10 list, abstract, or concrete were all retrieved freely-successfully. In spite of the fact that it has been mentioned in figure 2 that the same percentage was achieved for both free and cued recall paradigms, the detailed statistical results indicate to us that 1 or 2 words mainly concrete were not retrieved with cues-successfully. The number of recalled words in serial recall paradigms is very few be it in 20 list, 10 list, abstract, or concrete. By this means, Arabic abstract and concrete words were better recalled in free recall paradigms and cued recall paradigms but more better in the former. In other words, Arabic abstract and concrete words are poorly recalled in serial recall paradigms.

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Within the above achieved objectives, it was also proposed to investigate the type of effect in the three recall types for the three participating groups. Statistical results identifying the type of effect (abstractness effect: advantage of abstract words recall over concrete ones), (concreteness effect: advantage of concrete words recall over abstract ones) and (zero effect: disadvantage of abstract words over concrete ones and vice versa), are shown in figure 4 below.

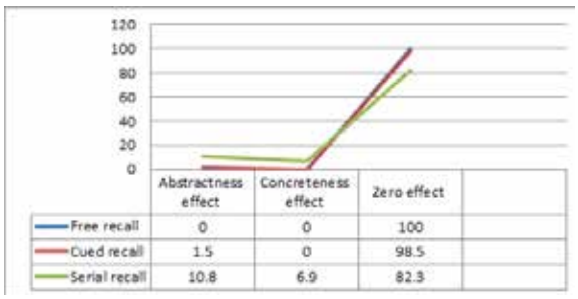

Figure 4: Abstractness, concreteness, or zero effect?

Generally, zero effect but neither abstractness nor concreteness effects is the most occurring type among the three types of effect in all: free, cued and serial recall paradigms. In detail, in free recall paradigms, there is neither an advantage of Arabic recalled abstract words over Arabic recalled concrete words (abstractness effect) nor there is an advantage of recalled Arabic concrete words over Arabic recalled abstract words (concreteness effect); it is rather a zero effect where the number of recalled abstract words is equal to the number of recalled concrete words in free recall paradigms. In the case of cued recall paradigms, there is a minor abstractness effect (1.5) thought the statistical value of zero effect is highly significant statistically (over 98). For serial recall, there is a minor effect of abstract words over concrete words with a highly significant zero effect. Say it another way, the percentage of zero effect is statistically significant with (82.3). The percentage of the abstractness effect (10.8) is higher than the percentage of concreteness effect (6.9) yet statistically insignificant. By this means, there seems to be a minor abstractness effect over concreteness effect which is insignificant statistically as compared to zero effect which outperformed both types of effects with a significant statistical percentage.

Descriptive statistical tools obtaining means and standard deviations were also computed to confirm the above presented results regarding the total number of recalled Arabic abstract and concrete words in free, cued and serial recall paradigms. The means and standard deviation for recalled Arabic abstract words in the three recall types for the three group are presented in table 7 below.

Table 7: Means and standard deviations of recalled words in free, cued, & serial recall paradigms

Recall type	Variable	N	Mean	Std. Deviation
Free Recall	Recalled abstract and concrete words	9	20.00	.00
	Recalled Abstract words	9	10.00	.00
	Recalled concrete words	9	10.00	.00
Cued Recall	Recalled abstract and concrete words	9	19.00	.44
	Recalled Abstract words	9	10.00	.00
	Recalled concrete words	9	9.78	.44
Serial Recall	Recalled abstract and concrete words	9	2.75	1.71
	Recalled Abstract words	9	1.75	.95
	Recalled concrete words	9	1.00	.35

The highest mean is for free recall and the lowest mean is for serial recall of Arabic abstract and concrete words. The mean for cued recall is very close to that of the free recall but with a minor advantage for the mean of free recall paradigms. Results in this table confirm that Arabic abstract and concrete words are strongly recalled in free recall paradigms and cued recall paradigms yet poorly recalled in serial recall paradigms.

Possible observed effect was also a major aim of our study where a number of effects in each recall type were observed. Possible observed and non-observed effects in each recall type are presented in table 8 below.

Table 8: Means and standard deviations of observed effects in free, cued & serial recall

Recall type	Variable	N	Mean	Std. Deviation
Free recall	Observed effects	130	1.65	.48
Cued recall	Observed effects	180	1.49	.50
	Forward recall	9	10	.00
	Backward recall	9	9.78	.44
Serial recall	All observed effects	130	2.34	.51
	Word length effect	130	.00	.00
	List length effect	130	.18	.38
	Primacy effect	130	.30	.46
	Recency effect	130	.70	.46
	Transposition gradients effect	130	1.00	.00
	Item confusion errors effect	130	.00	.00
	Repetition errors effect	130	.00	.00
	Fill-in-effect	130	.16	.40
	Protrusion effect	130	.00	.00

13 types of effects were generally specified for the three types of recall. Primacy and recency effects for free recall, forward and backward recall effects for cued recall and word length, list length, primacy, recency, transposition gradient, item confusion errors, repetition errors, fill-in and protrusion effects in serial recall. The four specified effects in both free and cued recall were observed. In serial recall, four effects were not observed at all, namely: word length effect, item confusion errors, repetition errors and protrusion effect. Further yet detailed analysis for the observed effects in each recall type is presented below in figures 5-7.

It was also hypothesized in our study that recency effect is more usual in occurrence than primacy effect in free recall paradigms of both abstract and concrete words. Figure 5 below presents the statistical results for the collected data in regard to this minor hypothesis.

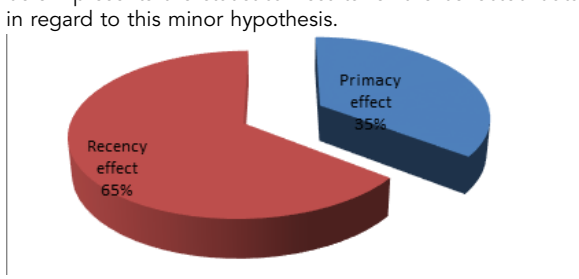

Figure 5: Comparison of primacy and recency effects in free recall paradigms

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Figure 5 above confirms the impressions in table 8 where it is very clear that occurrence of recency effect is more frequent than the primacy effect. In other words, the recall of abstract and concrete words tended to be from the most recent to the earliest ones other than from the top list to the the most recent ones. The percentage of the recency effect (65%) is about two times as the primacy effect (35%). To conclude, recency effect is more frequent than the primacy effect when using free recall paradigms, according to the presented data and results in our study.

Cued recall paradigms were performed using two different tests and/or procedures: forward and backward recall tests. The results of the possible differences between these two used procedures are shown in figure 6 below.

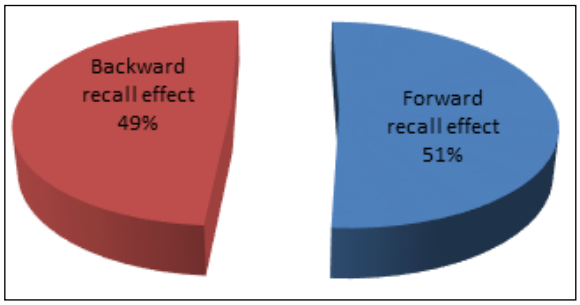

Figure 6: Comparison of forward and backward effects in cue recall paradigms

The results in figure 6 confirm the impressions in table 9 in regard to the advantage of forward recall test over backward recall test of vice versa. In other words, the percentage of the forward recall effect is nearly similar to that of the backward recall effect, (51%) for the former as compared to (49%) for the latter. This means again that the different between the two types of tests in cued recall paradigms of Arabic abstract and concrete words is statistically insignificant.

The percentages of observed effects in serial recall paradigms of Arabic abstract and concrete words are presented below in figure 7.

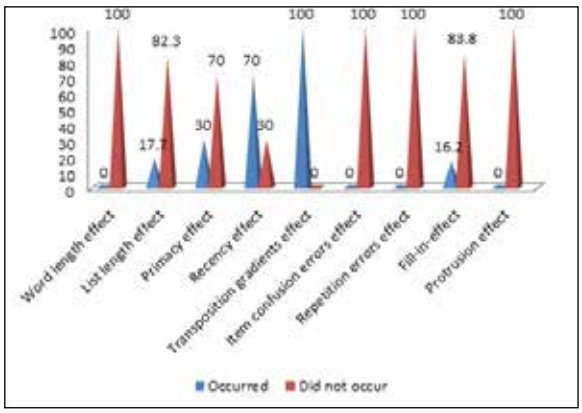

Figure 7: Comparison of observed effects in serial recall paradigms

The results in figure 7 confirm the impressions in table 7. Simply say, four of the 9 listed effects were not observed at all during serial recall paradigms of Arabic abstract and concrete words: word length effect, item confusion errors effect, repetition errors effect and protrusion effect (0%, 0%, 0% & 0%). On the other hand, there was only one type of the observed effects which occurred totally, namely transposition gradients effect (100%). Primacy and recency effects are exactly opposite to one another (30%- observed) for the former and (30- not observed) for the latter.

Discussion

Results in this study indicated clear-cut answers to the raised questions. Two main questions were raised in this study. The final answers for the raised questions are presented below in relation to our reviewed studies in the introductory part and statistical results in last part.

First, we wanted to know in which recall type our participants will recall more or less words. The results indicated that the participants recalled more words in free recall paradigms than those they recalled in both cued recall and serial recall paradigms. Again, they recalled more words in cued recall than those they recalled in serial recall. The difference between the recalled words in free recall and cued recall was statistically insignificant. On the other hand, it was statistically significant between the recalled words in serial recall and the other two types of recall (free recall and cued recall).

We attribute this to the view that serial recall requires basically more cognitive tasks than do free recall and cued recall. In other words, in free recall, it becomes maybe easy for the memory to encode, store yet retrieve the required words freely. Similarly, in the case of cued recall, the memory encodes, stores, and also retrieves the required words supported by the provided cues. Nevertheless, when it comes to serial recall, the memory encoded the words successfully and this is approved by the ability of our participants to recall all the words freely but not serially. Also, the memory stores the words successfully in the short-memory and this is also approved by their ability to retrieve the whole list of words again freely, yet with cues when requested but not serially. Hence, the memory was not able to retrieve the list of words serially and this was approved by the small number of recalled words-serially be it in the abstract words list, concrete words list, shortened list, or long list.

Within the same raised question, we wanted also to know if there is an advantage for abstract words over concrete ones or vice versa. The first type of effect is well-known as (concreteness effect) and we introduced a new type for the other effect called as (abstractness effect). We also introduced the term (zero effect) to refer to the situation where the number of recalled abstract and concrete words is even. Our results indicated that the there is nearly no advantage neither for abstract words over concrete ones or vice versa, it is rather a zero effect. Say it another way, our statistical analysis indicated zero abstractness effect, yet zero concreteness effect in the case of free recall paradigms. On the other hand, the results revealed a minor abstractness effect in favour of the abstract words in the case of cued recall paradigms and serial recall paradigms.

Our results were based on earlier theories and a number of the conducted studies. These theories included *dual-coding theory* (Paivio, 1965; Paivio & Yuille, 1966; Paivio, 1968; Paivio & Foth, 1970; Paivio & Okovita, 1971; Paivio & Csapo, 1973; Paivio, 1974; Paivio, 1975; Paivio & Desrochers, 1981; Paivio, 1990) and *context availability theory* (Schwanenflugel & Akin 1993; Schwanenflugel, Akin, & Luh, 1992; Schwanenflugel, Henderson, & Fabricius, 1998; Schwanenflugel in Faust, 2012). In both theories, it is assumed that concrete words have an advantage over abstract words but with different interpretations and reasons.

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Studies which support concreteness effect included: (Dukes & Bastian, 1966; Schwa, Akin, & Luh, 1992; Walker & Hulme, 1999; West & Holcomb, 2000; Binder, Westbury, & McKiernan, 2005; Wiemer-Hastings, 2005; Fliessbach, Weis, & Klaver, 2006; Il'yuchenok, Sysoeva, & Ivanitskii, 2008; Harad & Coch, 2009; Lagishetti & Goswami, 2012; Hanley, Hunt, Steed, & Jackman, 2013). On the other hand, studies which reported different processes for the comprehension, processing and production of abstract and concrete words including recall included: (Prior, Cumming, & Hendy, 1984; Rastatter, Dell, & McGuire, 1987; Duñabeitia, Avilés, & Afonso, 2005; Mestres-Misse´, Mu¨nte, & Rodriguez-Fornells, 2008; Campos, 2009; Pobric, Lambon-Ralph, & Jefferies, 2009; Crutch & Warrington, 2005; Wang, Conder, & Blitzer, 2010; Borghi,, Flumini, & Cimatti, 2011; Weiss, Mueller, & Mertens, 2011; Farley, Ramonda, & Liu, 2012; Marques & Nunes, 2012; Yao, Vasiljevic, & Weick, 2013).

Our second raised question was to know the observed effects in each recall type. Our results revealed that the occurrence of two effects in free recall paradigms (primacy and recency effects with a statistical significance in favour of the latter), two in the cued recall paradigms (forward and backward effects with a minor statistical insignificant difference in favour of the former) and only five observed effects in the case of serial recall paradigms from among 9 pre-specified effects. The observed effects in serial recall were (transposition gradients effect= 100, primacy effect= 30, recency effect= 70, list length effect= over 17, and fill-in effect= over 16) and they were variable in terms of frequency level. The non-observed effects were: word length, item confusion errors, repetition errors and protrusion.

Conclusions

In the present study, we investigated one of the memory processes, mainly retrieval/recall of Arabic abstract and concrete words using three types of recall: free, cued and serial. A three-group non-experimental design with 9 undergraduates in each was used to see in which type of recall the participants will recall more words and whether abstract or concrete words are remembered more strongly. Our results indicated that both abstract and concrete words are remembered much better in free recall paradigms, better in cued recall paradigms but less inferior in serial recall paradigms. This means that the less memory tasks, the better the recalled will be as in the case of both free and cued recall tasks. On the contrary, the more the memory tasks are, the less the recalled words will be as in the case of serial recall tasks. We also concluded that there was neither an abstractness effect nor a concreteness effect among the three recall types; it was rather a zero effect albeit a minor abstractness effect was calculated in the case of cued and serial recall types. Finally, in terms of the observed effects, we observed primacy and recency effects during free recall paradigms with a major frequency for the latter. Again, we observed forward and backward effects during cued recall paradigms with insignificant difference in favour of the former. In the case of serial recall, on the other hand, 4 among the pre-specified 9 effects were not observed at all (word length, item confusion errors, repetition errors and protrusion effects) as compared to the observed ones with different frequency levels (transposition gradients effect, primacy effect, recency effect, list length effect and fill-in effect).

Implications

This study has two implications: the first is pedagogical and the second is cognitive. In the first case, these results indicate to us that among these three recall types, teachers and learners as well can decide on the best type of recall that would help in learning and acquiring more vocabulary in particular and language in general. Free recall in this case, for example proved to be the best type for learning and teaching language patterns and items (patterns and items refers here to sounds, words, phrases, and sentences). Cued recall might be also an effective way for teaching in the very early stages where learners need to be motivated and different types of cues could be used to achieve so. Serial recall might not be that effective for teaching vocabulary (memorization) but might be very effective if merged with certain teaching strategies for phonetics, phonology, morphology and lexicography.

The second implication is the indication that human memory seems to stand puzzled when being required to recall a list of words serially. The memory tends to encode yet stores the words successfully and even the retrieval but freely and with cues other than serially. Of course, this doesn't mean that human memory cannot retrieve a list of words serially, for it can do so for words, sentences, texts and even long scripts but these tasks need to be performed in the long-term memory other than the short-term memory as was done in our current study.

Limitations and future work

There were two limitations observed in this study. First, the study included only male participants as it was not possible to include female participants due to country environmental reasons. It is better in such studies to include both gender types though significant differences in words recall between the two gender types have not been reported (see Lagishetti & Goswami, 2012).

Secondly, future research should account for possible correlations between short-term memory recall and factors affecting memory recall (e.g. motivation, attention, interference, etc.).

Acknowledgments

We would like to greatly thank the Research Centre in the College of Languages and Translation Studies and the Deanship of Scientific Research for their financial support of this project under (Cognitive Linguistics Research Group), King Saud University, Riyadh, Kingdom of Saudi Arabia.

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