Abstract and Concrete Nouns in Short-Term Memory: an Experimental Study

Abdullah Alhasan Alameer
Imam Mohammad University, Languages and Translation College

ABSTRACT
For about three decades, psychologists have postulated the existence of human memorysystems. Many speculations concerning memory have come up since Hebb (1949), Miller(1956), and Broadbent (1958). Between 1950s and 1960s short-term memory (STM)drew the attention of many scientists in different fields. Investigating short-term memoryhas become very popular globally especially in psycholinguistic, cognitive, andneurolinguistic domains. This paper aimed to explore the memorizing of concrete andabstract nouns to find out if nouns referring to tangible objects are easier to memorizethan those referring to intangible ones. To answer the research questions, an experimentalstudy was conducted on a group of male participants who underwent three variousdifferent studies in Riyadh city, Saudi Arabia. This experimental study used analyticmethod and statistical analysis. The results proved that concrete nouns are greater innumber in short-term memory than abstract nouns. Moreover, processing concrete nouns iseasier than abstract nouns which proves also the effectiveness of concrete nouns. This result may contribute greatly in designing English curriculum for learners, enhancing processing linguistic concepts in short-term memory and developing the lexicon in memory.
Key words: short-term memory, memory, concrete nouns, abstract nouns, psycholinguistics, cognition and neurolinguistics.

I.   Introduction

Memory is a concern of many psycholinguistic studies and it has been studiedrigorously for a long time (Carroll, 2008). It refers to a group of networks of neocorticalneurons and connections that link them together (Fuster, 1999). Memory is broadlydefined as the capacity to retain information in the brain (Fuster, 1999 p.9). Definiteevidence suggests that human memory capacity depends vastly on memory systems andsubserves non-linguistic functions (Ullman, 2004).

Since the time of James (1950), the father of primary and secondary memory,memory studies have been revolutionized (Fuster, 1999; Carrol, 2008). Marshall andMagoun (1998) argue that human rudimentary knowledge could be found in Arabic-Latin revival and Western civilizations. Thus, by the seventeenth century, a new opticalmagnification was introduced by Dutch scientists, which facilitated the anatomicalstudies greatly (Marshall &Magoun, 1998). Golgi views that brain function emerges asintegrative or holistic aspects (Sporns, 2011).

Pioneers such as Atkinson and Shiffrin (1968) have conducted various studies onmemory with a conclusion of the nature of human memory. From psychological humanmemory, Atkinson and Shiffrin (1968) claim that there are two types of memory: short-termand long-term. Short-term memory is similar to a temporary storage with a finitebulk of information (Atkinson &Shiffrin, 1968).

However, short-term memory mediates external information from outside worldto the long-term memory via sensory organs to the brain (Anderson, 1995). GeorgeMiller (1965) affirms that the number of entities that human brain can hold in brain isbetween 5 up to 9 or 7 ± 2 Miller`s law which is known as the magic number. Lisman etal., (2001) views that memory span is about five words, six letters and seven digits.

The human brain has approximately over 100 billion neurons interconnected witha billion of fibers (Love & Web, 1992). The cortex occupies the surface of the brain,often called gray matter. Therefore, the brain is able to (1) send and receive messagesfrom all sensory organs, (2) control all voluntary and involuntary movements, and finally(3) represent memories (Fromkin et al., 2014).

1.1   Objectives of this research:
The goals of theis study are:
i- To explore how short-term memory decodes the abstract and concrete nouns.
ii- To find the difference between linguistic concepts in terms of memorization leveland processing in short-

term memory.

1.2   Definition of operational Terms:
•   Short-term memory: is a system that enables people to reflect many features of the information-processing metaphor of memory temporally (Thorn and Page, 2008).
•   Memory: defined as "the knowledge of an event or fact of which in meantime we have not been thinking with the additional consciousness that we have thought or experienced it before" (James, 1950).
•   Concrete nouns: are nouns that can be perceived by physical features via senses (Wiemer-Hastings&Xu, 2005).
•   Abstract nouns: nouns that have no referent objects to identify (Wiemer-Hastings&Xu, 2005).
•   Psycholinguistics: is "an interdisciplinary field of study in which the goals are to understand how people acquire language, how people use language to speak and understand one another, and how language is represented and processed in the brain." (Fernandez and Cairns, 2011).
•   Cognition: refers to the nature of memories at the highest level of analysis and the psychological level (Eichenbaum, 2002).

II.   Literature Review

Studying memory has a long history in psychology. Carrols (2008) claims thatsystematic studies of memory were applied in the late of nineteenth century. It refers to amechanism that allows humans to retain and retrieve information constantly. Memory isan intrinsic and cognitive process that may be advocated to acquire new knowledge andremember information (Bartlett, 1932).

William James (1950) affirms that contemporary studies of memory underpin thedichotomy of short and long term memory which he calls primary and secondary memory(Thorn & Page, 2008). However, memory studies began in the late 1950s (Carrol, 2008).In addition, the domains of memory study and language have catalyzed a synergisticeffect to each other since early views. Human memory was postulated by Atkinson andShiffrin who proposed broadly three sets of memory systems: sensory, short-term andlong-term (Elizabeth Bjork & Robert Bjork, 1996). Many scholars (1) differentiatebetween explicit and implicit memories, (2) express intentional or conscious events andfinally (3) reflect processing information (Zhang et al., 1997).Remembering is experienced when a mental incident is attributed to the memory(Jacoby et el., 1989). Fuster (1999 p.12) distinguishes memory systems according tomany attributes: "1- the content that systems store 2- principles of operation of storageand retrieval 3- storage capacity 4- duration 5- putative neural structure and finally 6-mechanism involved in their operations".However, Wierzbicka (2007) delineates that memory is a mentalistic term ratherthan a psychological notion in the brain; mentalistic concepts such as thinking could bedefinitely fruitful. Hence, memory systems also involve brain system in which diffusionareas of the cortex feed into different subcortical areas.

2.1 Brain Structure

In 1854, Gratiolet, a French anatomist, concludes that anterior lobes were honored to be centers for human`s intellectual faculties, but sensation, inclination and passion were assigned in parietal and occipital lobes (cited in Marshall &Magoun, 1998). However, Marshall &Magoun (1998) persisted that the brain in vertebrates may consist of two parts: Paleo which means "old" and the neopallium which means "more recent".

Love and Webb (1992) underpin the brain knowledge intensively and extensively from neurological perspective and they thoroughly succeed. In their book, "Neurology for the Speech-Language Pathologist", Love and Webb dissect the brain in depth. The brain's color is gray and it is similar to an oval melon with soft touch. The brain weighs 1,350 grams in average, approximately three pounds (Love and Web, 1992; Sporns, 2011). It is naturally placed in the bony skull part particularly called cranium. Encephalon is brain's synonym. Cerebrum is an identification of the largest mass in brain. The human cerebrum includes three parts: the cerebral hemispheres, the basal ganglia and the rhinencephelon. Thus, Love and Web (1992) assess those parts, as explained in the following respectively: the cerebral hemispheres constitute the two halves of the brain. Critically, they are discriminated and readily discernible. The equivalent halves are connected by the corpus callosum. Differently, the corpus callosum is nothing rather than a mass of white matter. The masses of gray matter located deep within the cerebrum are the basal ganglia. It is directly below the cerebral cortex. The basal ganglia consists of the corpus striatum. It is associated with motor functions. The rhinencephelon is part of the old brain which the prefix rhino terminology refers to nose. Accordingly, the term is easy to see that the functions of the brain of old species deal primarily with olfaction or smell. Hence, the brain structure is oval shaped with a tail-like appendage which is termed spinal cord hanging from the base.

However, brainstem is a hidden part internally that could not be viewed unless the cerebral hemispheres are cut away. It is intertwined with spinal cords, thrust upward into the brain between the cerebral hemispheres. Hence, brainstem fits with cranium proportionately because the upper structures are crowded

(Love and Web, 1992).

2.2 Retina Region

Retina is a central region of the nervous system that highly catalyzes the reception of light (Lolley& Farber, 1977). It mainly transmits the encoded visual items to the brain (Lolley& Farber, 1977). Retina is a structural layer with a finite number of cellular classes. Thus, investigations recently confirm that transmitter is released twice alternatively: in the dark and in the existence of light (Lolley& Farber, 1977). A photoreceptor cell works as a unit functionally with a subdivision of discrete morphological compartment. Consequently, it consists of outer and inner segments. Therefore, outer segment encompasses light absorbing visual pigment, the lateral inner segment rich in mitochondria, a nucleus and located in soma cell (Lolley& Farber, 1977). The photoreceptor has generally two classes 1- rods and 2-cones (Lolley& Farber, 1977). Retinal processes work to transform the pictorial representations to an appropriate format that will enable the optic nerve to transmit the data to the central brain structure (Heydt, 2004).

2.3   Human Memory

Ashcraft (1994) views thata plethora of philosophers such as Plato, Socrates, Aristotle and many others wereconcerned with memory and nature of thought. Eichenbaum (2002) claims that memory reflects the quantities of a lifetimeexperience. The nature of memory has been investigated from various fields such as:biology, neurology and psychology. However, with the rise of modern sciences ofneuroscience and cognitive science, the recent mechanisms insights of memory have beenemerged (Eichenbaum, 2002). Basically, memory is a multi network of neocorticalneurons and cells (Fuster, 1999). Experiences of these networks depend on the diverseaspects of inner and outer environment. A network may vary in size and it is modifiablewidely by further experience. Thus, it is subject to growth. Memory is working in anassociation between stimuli and reinforcement in order to constitute the memory system. According to Ashcraft (1994),three important aspects of human memory are included: (1) initial acquisition ofinformation, (2) subsequent retention of information, and (3) recall of information.Conversely, Fuster (1999) affirms radically that association must be attributed toall memories, at the root of their genesis and their evocation. Eichenbaum (2002) arguesthat memories are diffusely distributed in the brain. Gallistel (2006) persists that the"essential function of memory is the carrying of information forward in time. It is therepository where information resides when it is not used".

2.4   Phyletic and Individual Memory

Intrinsically, information undergoes of the basic forms and brain`s connections atbirth. This amount of structural memory, which comprises the primary sensory and motorneocortical systems, could be described as phyletic memory. More specifically, phyleticmemory can be expressed simply as the memory of species. In other words, it looks likean inherited endowment that human beings come with. However, it is immenselyadaptive (Fuster, 1999).

Conversely, individual memory is localized but not mostly in the cortex ofassociation. It is firmly a genetic structure foundation of the cortex. However, memorycould be expanded throughout individual experiences. In addition, it is constructed from asynaptic connection between neurons that represent the sensory and the internal orexternal world (Fuster, 1999). Thus, (Fuster, 1999) affirms that memory has varioussystems rather than a simple unitary or dual phenomenon. Therefore, individual memorycorresponds to the experiences from external world. James (1950) states that there aremore methods to store information in the memory. This belief constitutes the basis formulti-store model of memory which later on was proposed by Atkinson and Shiffrin(1968). Consequently, this theory proposes that memory has three separate structures: 1-sensory store, 2- short-term memory and 3- long-term memory. These stores arepresumably permanent and consistent like computer hardware. Every memory hasdistinctive properties concerning its capacity, duration and code (Fuster, 1999).

2.5 Taxonomies of Memory

Human memory synthesizes of short and long-term memory separately (James,1950). Memory is identified in terms of retention, acquisition and retrieval mechanismsfor the external world (Gallagher, 1990).James (1950) dissociates between primary memory which he views as awareness of what has happened and secondary memory which he views as our knowledge andexperiences of events that move from consciousness part to the part of the psychology. More than fifty years later, dissociation between the notion of short-term andlong-term memory has been supported by Hebb. The only distinction betweendichotomies of memory has an absolute of neuropsychological perspective (Thorn &Page, 2008). There are two separable systems: the first depends on the reverberatingelectrical activity temporarily and the second depends on neural growth to represent amore long-term memory (Baddeley, 1990a). Norman and Rumelhart (1970) portrayinformation that first comes to a sensory organ before it was recoded into the storage ofshort-term

memory. Then, if information were rehearsed properly and intensively, itwould be sucked in the long-term memory for last, otherwise they were be lost or at leasthard to remember. This dichotomy predominated vastly in late of 19650s (Vallar&Shallice, 1990).

Conversely, in the early 1960s the previous assumption of a dichotomy becameunnecessary and unparsimonious (Baddeley, 1990a). In addition, Melton (1963) claimsthat the phenomena attributed to short-term memory might be conceptualized better asthe reverberating of long-term memory functions. In the mid of 1960s, a flurry of giganticactivity concerned with the question of assuming that memory was necessarily dividedinto long-term memory and short-term memory (Baddeley, 1966).

Nevertheless, Craick and Lockhart suggest that instead of treating long-term andshort-term memory as discrete systems, it could be more valuable to elucidate thedurability differences of memory as a sign result of coding (Baddeley, 1990a). Theyclaim that a dichotomy view of memory could be depending on the processes of aprimary system of memory.

2.5.1 Short Term Memory (STM)

James (1950) explains short-term memory as the conscious contents in particularthe internal thoughts and fleeting accesses. Its contents may endure only entity and lastuntil we lose our attention. STM is eminently an active content of mind and conceived asa perceptual analysis (Nairne, 1996). Gerard and Hebb verify that the concept of short-term memory is akin to heightened activation (Nairne, 1996). The capacity of short-termmemory is entirely limited. It allows retaining information for a limit period of time. Tobe more specific, adult`s memory is approximately between 5 and 9 irrelevant items(Miller, 1956).

Short-term memory capacity usually increases until it reaches a maximumin young adulthood and starts to be decreased in old age (Kail&Salthouse, 1994).Ebbinghaus (1885/1913) conducted a study concerning the short-term memory capacityand he concluded that seven unrelated pictures or words were remembered. Short-termstorage may be vital for many activities (Pashler& Carrier, 1996). The necessity of STMfor the brain is high on the grounds that it is needed to have some capability mechanismsof doing tasks. Any absence of rehears gradually causes the decay with time unlessrefreshed (Pashler& Carrier, 1996).

2.5.1.1 Working Memory

Cognitive psychologists have developed the mechanisms of short-term memory in order to clarify how it helps us interact with external world and achieve our goals. Working memory exploration goes back to 1880s when Ebbinghaus presented the experiments in controlled studies (Yuan et al., 2006). In spite of enormous studies regarding working memory, researchers have no consensus on one definition (Yuan et al., 2006; Carroll, 2008). Instead, most researchers such as Baddeley and Hitch agree that working memory may look like stores of task-relevant information (Yuan et al., 2006). Interestingly, the STM study was decreasing strongly in the 1970s. Accordingly, Baddeley and Hitch (1974) have developed a concept of working memory at a theoretical level. Baddeley (1990b) views that the concept of working memory is connected primarily with the correlation between memory and cognitive performance.

The contemporary conceptualization of short-term memory is considerably working memory (Baddeley, 1986). Miller, Galanter and Pribram consented to call short-term memory "working memory (WM)": emphatically serves as advocate system for doing cognitive work, such as:- listening, reasoning or making decisions (Baddeley, 1990b). Kellogg et al. (2007) view working memory as a temporarily system that preserves images and their representation in order to perform tasks cognitively.

Baddeley and Hitch (1974) view working memory as a confined capacity system

that helps to store and modify information. Therefore, it holds about seven units of information (Carroll, 2008). Working memory has undergone substantial amendments and refreshments in the past two decades, but it has sundry incarnations which lead to yield fruitfully (Baddeley, 1986). However, three components characterize the model: central executive, visouspatial sketchpad and phonological loop. Carroll (2008) explains those components:1- the central executive effectively determines what the latter component should do at any given time. It is a limited assumption in terms of numbers of things people could do simultaneously. However, Carroll (2008) claims that the notion of executive is, for psychologists, a bit vague and Baddeley (2000) agrees that some functions could be thought of a simple term but have not been yet fully explored. 2- the visouspatial sketchpad temporarily maintains and deals with the information of visuo-spatial one. It is essentially the system that endows human brain to form visual images, convert words into images and so forth. 3- the phonological loop expresses the auditory rehearsal system.

Auditory storage holdsphonological representation shortly. Consequently, working memory assumes thatphonological representation could store both visual and auditory material such as letterswhich may convert into a phonological store.Historically, it was easy for psychologists to find limitations of the short-termmemory. Similarly, Kane et al., (2005) argue that WM is "a system consisting of (1) astore in the form of long-term memory traces active above threshold, (2) processes forachieving and maintaining that activation, and (3)

controlled attention". Thus, in boththeories, STM is a subcomponent of WM. STM is a subset of WM, (i.e., WM = STM +attention), performance on STM tasks should be related to performance on WM tasks (Kail& Hall, 2001).

The literature of short-term memory remains a controversial term. Researchersmaintain that there could be a pure recovery at least of the elements maintained at theconscious awareness attention (Meier & Graf, 2000). Working memory is a kind of short-term memory that people rely on when they rehearse to memorize. Information could beforgotten as soon as it is no longer relevant. Amazingly, this is why it is called workingmemory (Miller & Wallis, 2004).Baddeley and Logie state working memory as: it comprises functionalcomponents of cognition that permit humans to comprehend, retain and support acquisition of new knowledge (Mendoca et al., 2003).

2.5.2 Long Term Memory (LTM)

Long-term memory is defined as a structural memory that preserves knowledgepermanently (Caroll, 2008). James (1950) denotes in his great book, "The Principles ofPsychology" that there is a distinction between two types of memory: primary andsecondary memory. Therefore, James (1950) explains that secondary memory is thegargantuan amount of information from the past that can be called up at various

occasions. In other word, long-term memory has an infinite capacity.Furthermore, Tulving (1972) suggests that long-term memory has two distinctiveaspects; episodic and semantic. Miller (1956) claims that long-term memory may greatlyexpand short-term memory. Hebb (1949) states that long-term memory requires theability of consolidating the activity. The representation of knowledge in long-termmemory may posit two types: explicit and implicit memories (Martensson, 2008). Sincethe explicit memory may involve conscious potential, the recall implicit memory stickswith learning motor skills such as riding a bike more importantly unconsciously (Kandelet al., 2000).

2.4 Concrete and Abstract Concepts

Over forty years, the dichotomy between concrete and abstract has beeninvestigated from divergent perspectives. One perspective is from rating studies whichdescribe concrete words as mostly: imaginable, easier to remember in a context, familiarmore or less and acquired earlier and simpler during infancy than abstract words (Barcaet al., 2002). Second perspective is from behavioral experiments which suggest thatconcrete words have a cognitive advantage over abstract meanings in terms of accuracyand speed (Binder et al., 2005). But in a third perspective, the differences betweenconcrete and abstract concepts theoretically could be explained in terms of 1- greaterexistence in perceptual information 2- in verbal information (Paivio, 1986) and finally 3-exist in contextual information (Schwanenfluge PJ, 1991) for the sake of concrete againstabstract concepts.As a matter of fact, Ghio, Vaghi and Tettamanti (2013) argue that it is possiblyaugmenting the level of categories resolution within the concrete and abstract domainsemantically. Accordingly, among concrete domain, various categories have beenidentified. Ghio, Vaghi and Tettamanti (2013) propose that concrete inventories arecharacterized by salient dimensions that may allow them to be classified in categories. Apotential exploration of the phenomenon of concrete words may advocate that thosewords belong to the same category and typically share some features (Wiemer-Hasting etal.; 2001; Taylor et al., 2007). Concrete nouns could be accessed faster and moreaccurately than abstract one in numerous cognitive tasks. Word recognition, recall lexicaland comprehensive sentences are included (Martensson, 2008).

Concrete nouns are stored in the visual system but abstract nouns have noreferents in the visual system and therefore no shared referent in two languages forbilingual subjects (Francis &Goldmann, 2011). Monolingual studies propose thatabstract nouns have fewer components than concrete nouns (Francis and Goldmann,2011).However, seminal studies prove that concrete and linguistic stimuli have

cognitive processing advantages (Weiss and Muller, 2013). In addition, concrete nounsactivate two systems: verbal and imagery systems to a higher degree whereas abstractnouns are restricted to the verbal system mainly (Martensson, 2008). Imageability bydefinition has a strong correlation with concreteness (Fliessbach et al., 2006). Further,Kellogg et al. (2007) support the view that concrete nouns activate two systems: imaginable and propositional systems in planning the content of definitions.Martensson (2008) views that concrete nouns have most of the needed features tocomprehend nouns and they are stable across different context while the abstract nounsare not stable in context frequently. In other memory tasks, charged words are easier tobe remembered than neutral ones (Goldstein, 2008).Many works on language comprehension agree that when a situation is there, aconcrete concept is easy to process (Barsalou&Wiemer-Hastings, 2005). Therefore, tounderstand concrete nouns, scientists should take into consideration the settings in whichthey are used. For example, a chair may rely not only on the physical aspects of the entityi.e. classroom but further on the theme it is seen and the way the activities are performedin i.e. attending classroom (Barsalou&Wiemer-Hastings, 2005).Concrete nouns process faster and they are remembered more accurately thanabstract nouns; therefore these effects apply also to sentences (McDougall & Pfeifer,2012).

The Swedish national Encyclopedia Lexicon defines the concrete and abstractconcepts. It defines concrete nouns as those identify anything that can be weighed anddirectly perceived with the five senses (Martensson, 2008). In other words, things thatcan be seen, touched, smelled, heard and tasted such as objects, creatures, material and soforth. Francis and Goldmann (2011) propose that concrete nouns possess a huge numberof semantic features consistently.

Conversely, abstract nouns describe intangible notions and phenomena. Thephysical mass is lost. Barsalou and Wiemer-Hastings (2005) elucidate abstract conceptsas any entity which is neither entirely tangible nor constrained spatially. A recentexplanatory study demonstrates that abstract nouns may contain motor information(Barsalou&Wiemer-Hastings, 2005). Therefore, abstract nouns can include examples ofproperty, condition, time and event. Abstract nouns are derived mainly from verbs oradjectives. Wiemer-Hastings et al., (2001) say that many abstract nouns sharecharacteristics with verbs. Nevertheless, concreteness and abstractness are alternativelyviewed as a continuum rather than a dichotomy (Wiemer-Hastings et al., 2001; Crutch &Warrington, 2005). Abstract nouns have fewer and less accessed features (Plaut&Shallice, 1993). Abstract words refer to entities that neither constrained physically norspatially, abstract concepts have a low inter-category distinctiveness (Ghio, Vaghi and

Tettamanti, (2013) and often do not have physical referent without considering thehomogeneity of meanings (Cappa, 2008).

Abstract concepts could not associate with situations easily due to the difficultiesin processing words (Barsalou&Wiemer-Hastings, 2005). To process nouns, people mayneed a relevant place to link the concept and facilitate retrieving it. For instance, the brainmay not process a concept such as truth unless a real situation is used to apply thisconcept (Barsalou&Wiemer-Hastings, 2005). Abstract nouns have less associationknowledge and they barely have association with other concepts because they are weak(Rodríguez-Ferreiro et al., 2011). Memorizing performance level for abstract nouns isless fast than concrete nouns (Francis and Goldmann, 2011).

The differences that appear with concrete and abstract nouns reflect thedifferences in the quality of associative networks in this regard inside the brain (Vallarand Shallice, 1990). Accordingly, the distinction between concrete and abstract nounsembeds in different principles qualitatively in terms of categorical and associativeorganization (Dunabeitia et al., 2009). Processing concrete nouns depends on theperception of physical entities, action, introspective and the state of physiology whereasabstract nouns depend on "the account of the simulation of internal, affective states andobjective or contextual situations and process" (Wiemer-Hastings &Xu, 2005). Humanbeings acquire concrete nouns from early infancy and they remember as well as organizethem more rapidly than abstract ones (Kroll &Merves, 1986).However, a plethora of studies discuss that concrete concepts compared toabstract concepts are greatly activated (Wang et al., 2010). In particular, imagery-basedand perceptual regions may be reported to be activated for concrete more than abstractnouns contrasted to several studies (Fibach and Friederici, 2004; Binder et al., 2005).Furthermore, the foci for the mental image generally vary from predominantly righthemisphere (Paivio, 1991) to the left hemisphere to the bilateral regions (Binder et al.,2005). Kellogg et al., (2007) argue that written definitions of concrete nouns may payattention on pictorial besides explanatory representations. They support this claim by thesubjects' reaction of swift initiate of production and detail composition of concrete nouns.Furthermore, studies report that participants use images more often than abstract nouns.From a neurological perspective, Sabsevitz et al., (2005) and Binder et al., (2005)conclude that concrete nouns are processed vastly in a bilateral network whereas abstractnouns are processed in the left inferior frontal and left superior temporal cortex. Thus,representation of concrete words by neurons could be postulated to pervade over bothhemispheres whereas the represented words, which refer to function and abstract wordscould be rigorously left lateralized (Martensson, 2008).Accordingly, concrete concepts could be more easily visualized than abstractconcepts. They are highly connected to the visual system, whereas abstract concepts arenot visualized (Kosslyn et al., 2001).Furthermore, Schwanenflunel, Shoben and their colleagues demonstrate thatconcrete concepts get the advantages against abstract concepts. The advantages are: 1- formemory, concrete nouns are faster than abstract nouns 2- word comprehension in thebrain is faster for the concrete words and finally 3- lexical access for concrete nouns isfaster in processing than abstract nouns (Barsalow&Wiemer-Hastings, 2005).Hence, participants consistently use images to represent concrete nouns whereasthey initially access words association for the isolated abstract nouns, respectively(Barsalow&Wiemer-Hastings, 2005).

III. The Experiments and Methodology

The experiments were conducted in three contrast tasks. The first task wasdesigned to memorize words that have been selected for the study through using botheyes. The second task was free right eye and restricted to covered left eye. The third taskwas free left eye with covered right eye. Finally, the statistical analysis was used todetermine what they had retained in their short-term memory.

3.1 Subjects` Task

The participants' task was to look at ninety words for sixty seconds and then tryto write them on a white sheet from their memory. Participants were instructed that wordsafter sixty seconds would be removed and the other group of words would be seen for only sixtyseconds whether or not the words were seen or memorized. Therefore, they wrote whatthey remembered on sheets. The sheets were collected at the end of the experiment inorder to be analyzed statistically.

3.2 Participants

The experimental studies were conducted in Riyadh. The experimental populations were twenty and fourteen year old malestudents. The selection was made randomly according to numeric list. Participantsperformed three contrastive tests. None of the participants was aware of the hypothesiseven the two categories of words, concrete and abstract nouns. The participants were drawn from the same population and therefore considered to be equivalent in cultural and socio-economic status. They were in second intermediatelevel. They all had normal vision without any correction. The participants completed the three different experiments tests. Hence, they were homogeneous.

3.3 Tools

The experiments were designed on a PowerPoint slides on a Macintosh computer. White color was the background for the slides of words. Nouns were written in black and attributed to Times New Roman font, size 32. The concrete and abstract nouns were shown via a projector on and the screen was about 2m2. The participants were properly seated in order to allow them to see the board clearly. The distance between participants and the board varied from 1 to 2 meters. When the projector's light was on, the lights of the room were dimmed.

3.4 Results

From the three various experiments the median proves that concrete nouns are more than abstract nouns in STM as follows:

Experiment One:-

The subjects used both eyes without restriction. The total number of nouns here are 600 nouns: 30 nouns (15 concrete nouns and 15 abstract nouns) for each one of the 20 subjects. They wrote 125 abstract nouns and 203 of concrete nouns. Therefore, the latter exceeded the former by a variant of 51 nouns. This result confirms that concrete nouns are more than abstract nouns. It substantiates that short-term memory remembers concrete nouns easier than abstract nouns by using both eyes.

Further, it affirms that the hypothesis of this paper is confirmed statistically by this experiment. In addition, the result tells that if we increase the concrete and abstract nouns the same result tentatively will come up $=1<r<$; which tells a positive correlation.

The analytic result obviously was demonstrated, with the advocate of both eyes, subjects memorized 203 concrete nouns and 152 abstract nouns. This result confirms that concrete nouns are processed in brain faster and more easily than abstract nouns.

Name	Number	Mean	Mode	Median
Concrete nouns	15	10.15	10-12	10
Abstract nouns	15	7.6	7	7
Subjects	20			

Table.1

Statistical summery on processing concepts

Table.1 confirms the hypothesis of this study, which predicts that memorizing concrete nouns is easier than abstract nouns.

However, Table.1 demonstrates that the mean of concrete nouns is remarkably greater than the mean of abstract nouns. It indicates that concrete nouns are actionable and more valuable than abstract nouns in short-term memory. Hence, the mean illustrates that concrete nouns' statistically are 10.15 while the abstract nouns' mean is 7.6.

Throughout mode, this evidence elucidates that concrete nouns are on the apogee compared to abstract nouns. Besides, it demonstrates that concrete nouns proceed on top no matter how many words could be listed.

Median is another strong evidence in this domain. It actually demonstrates consistent value for both concrete and abstract nouns. As the matter of fact, it proves that the more abstract nouns, the more poorly processed they

are.

Likewise, peculiar statistical evidence is deviation. It substantiates that abstract nouns are memorized poorly in short-term memory. In other words, abstract is weak in retention and recall as well.

Distinctively, memorizing concrete nouns via two eyes obtains Sy= $\sqrt{5.6275}$ while memorizing abstract nouns achieves only Sx= $\sqrt{4.14}$. These results all strongly support the hypothesis of the study.

Experiment Two:-

The participants, however, strictly covered their left eyes in order to use their right eyes solely. They had a look at the nouns, concrete and abstract respectively for sixty seconds. Then the string of words was removed from the screen so they can start to write words on their sheets.

The participants wrote 191 concrete nouns and 131 abstract nouns. The former list has predominantly outnumbered abstract nouns with a score of 61 variant words. This result confirms that concrete nouns are greater in number than abstract nouns. It substantiates that short-term memory remembers concrete nouns faster than abstract nouns by using right eye. Accordingly, it affirms that the hypothesis of this paper is confirmed statistically by this experiment, too. Hence, the result proves that abstract nouns are more difficult than concrete nouns in terms of memorization.

Further, the numeric result of processing nouns was 191 of concrete nouns, in the right eyes, and 131 for the abstract nouns. This data confirms that concrete nouns are easier than abstract nouns in retention from short-term memory.

Name	Number	Mean	Mode	Median
Concrete nouns	15	9.55	10	10
Abstract nouns	15	6.55	6	6
Subjects	20			

Table.2
Statistical summery on processing concepts

However, Table.2 demonstrates that the mean of concrete nouns is larger in short-term memory. It proves that concrete nouns are processed robustly. The mean shows that concrete nouns statistically are 9.55 while the abstract nouns' mean is 6.55.

Mode result significantly proves that the difference between both results illustrates that abstract nouns are endorsed poorly in short-term memory while the concrete nouns are processed highly. Median expresses the result fundamentally favoring concrete nouns. Therefore, another pattern of consistency appears here which confirms the study`s hypothesis.

Table.2 supports the hypothesis of this study which postulates that memorizing concrete nouns is easier than abstract nouns. The result is in favor of memorizing concrete concepts although the concepts were seen via the right eye. However, it confirms a positive relation, too.

The correlation between two variables is called Sy and Sx which denote that if one variable changes, the other variable will change too. The result of deviation was conspicuous for concrete nouns Sy= $\sqrt{10.1475}$ » 3.1855 compared to the lower result under abstract nouns which was Sx= $\sqrt{8.0475}$ » 2.8368.

Experiment Three:

The subjects were asked to cover their right eyes in order to use their left eyes solely. They had a look at the nouns (concrete and abstract) on the white board respectively for a minute. Then the string of words was removed after sixty seconds so that they would start writing words on their sheets depending on their memory.

The participants wrote 169 concrete nouns and 128 abstract nouns. The first group must be greater in number than abstract nouns with a score of 41 variant words. This result confirms that concrete nouns are processed more than abstract nouns. It substantiates that short-term memory by using left eye remembers concrete nouns more easily than abstract nouns. It also confirms the hypothesis of this paper and proves positive correlation statistically.

In the analytic result of the left eyes, subjects memorized 169 of concrete nouns and 128 from abstract nouns. This result confirms that concrete nouns are easier in retention and recalling than abstract nouns in short-term memory.

Name	Number	Mean	Mode	Median
Concrete nouns	15	8.45	10	9
Abstract nouns	15	6.4	4 and 8	6.5
Subjects	20			

Table.3

Statistical summery on processing concepts

Table.3 demonstrates that the mean of concrete nouns is considerably wider in short-term memory than the mean of abstract nouns. It denotes that concrete nouns are greater in number than abstract nouns in short-term memory.Hence, The mean demonstrates that concrete nouns' statistically are 8.45 while the abstract nouns' mean are 6.4.

Mode proves clear evidence in terms of memorization of concrete nouns in short-term memory via left eye.

On the other hand, the median of abstract nouns delegates weak result in front of the concrete nouns opponent.

Table.3 additionally confirms that retention and recalling concrete nouns are easier than those of abstract nouns. It illustrates that not all linguistic concepts are similarly memorized.

The statistical result of deviation substantiates that the left eye results solely were scored for the concrete nouns $Sy= \sqrt{9.0475} \approx 3.008$ and were scored $Sx= \sqrt{5.04} \approx 2.245$ for abstract nouns.

Box A demonstrates; below, the interquartile range, which measures the minimum and maximum amount of, memorized concrete and abstract nouns. It shows the finding that abstract nouns are more poorly remembered than concrete nouns.

IV. Finding and Discussion

Short-term memory deals with linguistic concepts differently. Abstract concepts are difficult tobe remembered in short-term memory whereas concrete ones are easy to be processed, memorized, and remembered. In fact, to memorize linguistic concepts, concrete conceptsmust be processed primarily in the brain because concreteness persists to retain linguisticconcepts for a long time. Abstract concepts should be memorized based on concrete ones.Consequently, prior knowledge from concrete concepts must support the abstract ones tobe memorized properly.

This discussion tackles the following: short-term memory, working memory, vision,abstract and concrete nouns, psycholinguistics, acquisition and cognition of abstract andconcrete nouns.

However, the study claims that, from the experimental studies, the subjects havememorized the concrete nouns faster for various reasons:

1- Human beings acquire concrete nouns from the early days of infancy

2- Subjects respond to concrete nouns swiftly because they conceive them moreeasily

3- Subjects depend on concrete nouns in order to process abstract nouns.

The subjects` mother tongue is Arabic and they learn English as a second language.

Therefore, the bilingual subjects have accessed concrete and abstract nouns in bothlanguages. If they find a referent, they recall the concrete noun; if they have no referentas in abstract noun, they barely recall the noun. Humans remember pictures better thanwords.

Short-term memory from a psycholinguistics perspective is finite in capacity. Thisstudy finds that decay may happen and cause people to forget. The researcher argues thatthere are various factors in short-term memory such as attention, vision and time thatsupport nouns to be processed for long time. In other words, this paper argues thatforgotten nouns were stable in memory unconsciously, but they need time to reflect thenouns because vision intrinsically rehearsed what subjects see.Nonetheless, the researcher argues that the fundamental differences between short-termand long-term memory in this paper vis-a`-vis are attention, vision and time. Theyplay major roles in rehearsing rather than demising those nouns which obviously accordwith the conclusion of other investigators who declare that reports of the demise of short-term memory might not be greater (Thorn & Page, 2008).

This study argues that short-term memory recalls concepts for a short period of timeto be remembered; otherwise the concepts will decay in the case of abstract concepts.Short-term memory operates exactly as cash memory in computer.Thus, this experimental study proves that short-term memory has a finite capacityin number and concrete nouns outnumber the abstract ones. Accordingly, the studypresumes that short-term memory work properly under the vision process. The essenceof short-term memory is attention and comprehension that help in rehearsing nouns.

Alvarez and Cavanagh (2004) assess that storage of short-term memory is one of themost significant components of cognitive activity. Further, short-term memory appearsfundamental for consciousness, but it might be mediated, transient and last only for amoment (Koch and Crick, 2004). Different scientists claim that Short-term memory is auniversal phenomenon among creatures particularly human beings unless there is deficit

inmemory such as amnesia (loss of memory) or loss of sense as in deaf and blind people.

Working memory could be used within cognitive tasks: learning, reading and soforth. The study argues that mental activities should be addressed from a cognitiveperspective rather than psycholinguistics perspective only. Consequently, this arguableissue against psycholinguistics coincides with Chomsky`s view of minimalist theory.Thus, the study endorses Melton`s (1963) argument that experiments on short-termmemory yield "readily interpretable results in terms of factors known to operate in long-termmemory". Hence, this paper strongly supports the Brown, Neath and Chaters`(2007) view that retrieving memory is distinctive in terms of location, temporal position,ordinal position and so forth.

Vision according to these experiments presents significant denotation to bothconcepts and processing information. In other words, those extracted result from theprevious experiments prove that the memory is pervasive over the cerebral cortexvisionary. Accordingly, processing information to brain via vision allows memory towork efficiently. But researcher presumes that time helps in exploring whether or notmemorized nouns in short-term memory are recalled. The role of sensor lies greatly inmemory.Although the role of sensors is vast in memory, vision is a peculiar andfundamental sense. In addition, sensors have a relationship with the cerebral cortex. Thisstudy claims that vision is very important for present and future because:

1-media and technology revolution addresses vision in the first place.

2-vision contributes to the taxonomy of language in terms of memory, retrieving, storing

and recalling linguistic aspects.

3-vision advocates learning language effectively.

Memory is a vital process in the brain particularly in the cerebral cortex. Thisview accordingly corresponds to the forms of visual storage among young people. Hence,it is foremost a universal sense which Descartes equates vision with touch.Many experiments examining the neural representation of concrete and abstractconcepts have been conducted (Wang et al., 2010). Studies have revealed the neural

representation of concrete and abstract nouns by incorporating existing neuroimagingevidence (Etkin and Wager, 2007). However, concrete nouns were activated strongly inthe left superior occipital gyrus, angular gyrus and culmen. Conversely, abstract nounswere activated in the precentral gyrus (Wang et al., 2010).

The researcher manifests that the correlation between sensor and representation ofexternal world in the brain is inevitable for many reasons:

1- the five senses mediate the external world to the brain since childhood.

2- the subjects memorized concepts based on either their vision or their sounds by

whispering.

3- vision stores external world visually whereas sounds are stored by auditory

system.

Psycholinguists address memory as a production of processing information intobrain and memory. This study addresses the short-term memory in the brain; it`s structureand mechanisms in terms of internal process in the brain. Psycholinguists address theexternal behavioral patterns of memory whereas neurolinguists address the internalphenomena of memory in the brain. The researcher suggests that memory should beplaced in neurolinguistics and not in psycholinguistics domain. Psycholinguistics viewsthat memory and learning are intertwined and they both could not be separated. Therefore,the only way they studied and referred to memory is through learning.

This study advocates to set psycholinguistics free from memory`s issues. Many evidence throughout neuroimaging and neurolinguistics fortify the researcher`sactionable view.

Linguists such as Naom Chomsky argue for accomplishing the feat of the nativelanguage by some neural machinery designed for this task (Ingram, 2007).

The researcherargues that this paper contributes to help educationists and pedagologists explain howlinguistic concepts of second language are acquired. Therefore, to acquire concrete andabstract concepts, this study suggests that learners should

1- Present concrete concepts either with visual materials or real objects.

2- Process these images to the short-term memory to have prior knowledge

3- Present abstract concepts based on concrete ones.

It is revealed that nouns associated with images are easier to remember. In the light ofthe study findings, concrete concepts can stimulate the level of language acquisition to alarge extend. This paper strongly recommends avoiding presenting abstract nouns firstdue to the difficulty in processing which may affect acquiring a language. It explores howlinguistic tangible and intangible concepts will be processed in the brain which obviouslycontributes to acquisition, cognition and teaching methods. Exposure to the visualizationprocesses effectively improves the cognitive skills in many areas upon interpersonal andintrapersonal levels.

Cognitive process reflects the mental ability of processing information for manypurposes and one of

them is retention. It moves smoothly from conscious (short-termmemory) to unconscious (long-term memory) process (Sommer and Wurtz, 2004).Cognitive perspective was effectively proved. Since the images were visuallyabsent, the subjects memorized the concrete nouns and remembered them more easilythan they did abstract nouns. This cognitive process proves that cognition plays asignificant role in order to process concrete nouns easily. Concrete nouns are processedmore rapidly than abstract nouns in various cognitive investigations including retention,retrieving and recalling (Jessen et al., 2000).

Furthermore, the metacognitive term refers to the language use and learning, socognitive processes advocate manipulating and storing information. However, Ingram(2007) affirms that language must be a cognitive rather than physical artifact. Thus,human sensory-motor and cognitive systems effectively cooperate to compose linguisticphenomena which have been formed by Chomsky in the Minimalist Programterminology in 1995.

This paper argues that since language is represented in the brain, it must be acognitive process for many reasons:
1- language is mentally stored.
2- brain`s functions such as thinking, retrieving and so forth are all in the brain.
3- neurons represent the external world in the brain then the processed world shouldbe produced by language.
4- cognition perceives the construction of language from all linguistic perspectivesuch as: phonology, syntax and semantics.

The physiological study tends to provide understanding observations that underlie themechanisms of cognitive processes in STM memory which is conscious memory(Echenbaum, 2002). Piaget views that language is a cognitive process rather thanprocessing information (Piattelli-Palmarini, 1980). Hence, these supportive views supportthe claim that language is not a behavioral phenomenon.

To provide many possible explanations of the concreteness effect, the researcherdraws attention to the following possible reasons:
Firstly, concrete concepts deal with images rather than mere perceptions. Thisrepresentation mentally may confirm the significance of concreteness. Therefore, mentalimages preserve the nouns for longer time than abstract nouns. Inevitably, concrete nounshave higher imageability than abstract ones (Wang et al., 2010).
Secondly, concrete nouns are acquired earlier in childhood and
Thirdly, Wang et al., (2010) confirm that concrete concepts are memorized andrecognized more rapidly than abstract ones.Fourthly, the absence of images on concrete concepts proved that there is no need forintegrated images to recognize concreteness. Concreteness could be interpreted withoutintegrating mental images. Scwanenflugel et al., (1992) confirm that abstract nouns arepoorly remembered in children and adults alike. Conversely, concrete nouns are hard toforget (Schwanenflugel et al., 1992). Many researchers agree that prior knowledgeinvokes the concreteness effect (Baralou&Wiemer-Hastings, 2005).

V.   Conclusion and Recommendations

Short-term memory plays a major role in the brain fundamentally with vision. Ithas a finite capacity in number approximately seven entities. It recalls imaginaryconcepts better than abstract ones. Memory in general and short-term memory inparticular is a universal aspect among humanity.

This study found that tangible linguistic concepts are easier to memorize thanintangible linguistic concepts. The experimental study helped to determine that short-term memory does not deal with linguistic concepts in an identical way. Thus, short-termmemory plays a great role in processing outer world as well as linguistic aspects inproduction, comprehend and speech.

The study also discovered that concrete concepts form knowledge andexperiences exist in the brain since early days of life. People rely on concrete concepts toacquire abstract ones but not vice versa. Therefore, the brain constitutes the lexicon fromchildhood based on concrete concepts.

Vision greatly contributed in retention of linguistic concepts quickly becauseconcrete ones always have a correlation with images which enable memory to correspondwell. Remembering concrete concepts in the absence of images proves that, as this studyargues, the effective of imaginary system in facilitating and recalling despite thelimitation of time. Therefore, visual materials lead to the expansion of visual memorywhich will be determined in the near future hopefully.Based on the study finding, abstract nouns were difficult to remember due to thelack of images. Brain processes abstract nouns alone without referent which makes themhard to memorize properly. Due to the difficulty of memorizing abstract concepts, thispaper encourages learners to rely on concrete concepts to facilitate their processing well.

However, psycholinguists greatly succeeded in their interpretations towardsmemory and its divisions, short and long-term memories as external behavioral.Neurolinguists address memory in the brain internally which determined that language,memory and its functions inside the brain.Conversely, this study supports the view that claims that language and brain areholistic phenomena from external and internal perspectives and both intertwined inneurolinguistics.

This paper addressed processing specific information; concrete and abstractconcepts in short-term memory coincide with mental skills such as memorizing, thinking,and recalling from cognitive perspective.

5.1 Recommendations:

In light of the significant findings of the current study, the following recommendationsshould be taken into consideration:

1- Short-term memory is significant in processing linguistic concepts as well asacquiring these concepts.

2- Short-term memory plays a major role in processing not concepts only but alsothe external world.

3- Abstract concepts are hard to process in short-term memory whereas concreteones are very easy in terms of processing, memorizing and remembering.

4- Abstract concepts must be built on concrete ones.

5- The future of linguistics science appears rigorously throughout the study inneurolinguistics domain.

6- Language must be addressed as holism rather than behavior.

7- Educationist, pedagologists, and curriculum designers should design materialsbased on concrete concepts and abstract ones respectively in order to facilitatelearning processes.

8- Cognition and neurolinguistics fundamentally tackle the language besides theexternal world in the brain.

5.2 Suggestions for further research:

1- Short-term memory vis-a`-vis concrete and abstract nouns: an auditoryexperimental study.

2- Further study is needed in long-term memory vis-a`-vis: concrete and abstractnouns: a visual experimental study to investigate the differences between long-termand short-term memories.

3- Long-term memory and processing intangible concept to discover the difficultiesof abstract nouns.

4- Further investigation is needed in exploring attention on processing informationof STM.

5- Exploring visual and noun processing is very important to reveal the role ofvision.

6- Exploring the role of VSTM in the control of saccadic eye movements must beinvestigated to shed light the relationship between eye movement and processinglinguistic notions.

7- Exploring visual saccade system upon visual memory.

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