1   **CONCRETE VS ABSTRACT WORDS – WHAT DO YOU RECALL**

2   **BETTER?**

3   **A STUDY ON DUAL CODING THEORY**

4   Lin Yui[1*], Roslin J. Ng[1], Hiran Perera-W.A[2].

5   [1]Department of Psychology – HELP College of Arts and Technology
6   [2]Department of Psychology – Durham University
7
8   *Corresponding Author:
9   Email: linyui@uymail.com
10

11

12   ***Abstract***

13   This study was conducted to investigate the theory of dual coding on remembering words, by

14   testing whether concrete words are better recalled than abstract words. A total of 298 (from Asian

15   ethnicity) participants took part in this study. The participants were divided into two groups, where

16   each group was given a list of abstract or concrete words. Then, they were asked to write down as

17   many words as they recall within two minute. The results demonstrated that the participants

18   recalled concrete words better than the abstract words, supporting previous studies.

19

20   *Keywords:* Dual Coding Theory, Concrete words, Abstract words, Asian Participants

21

22

23

Dual Coding Theory and Memory

The Dual Coding Theory (DCT), which was proposed by Allan Paivio in 1971, presumes that there are two separate cognitive subsystems. One is specialized for dealing with language, and the other deals with representation and processing of non-verbal objects (imagery). DCT is a general theory of cognition that accounts for both verbal and nonverbal cognition (Paivio, 1971). The non-verbal imagery deals with nonlinguistic understanding of the world. It is generally referred to as imagery because its main function is the generation of mental images (Sadoski, 2003). The verbal code specifically deals with language. This provides the means for communication, encoding, and decoding of messages. Paivio has proposed that there are two types of representational units known as imagens and logogens. Imagens represent mental images, while logogens represent verbal entities. Logogens are said to operate sequentially as words come one at a time in a form of sentence. Imagens are said to operate synchronously or in parallel as all parts of the image are accessible at once (Paivio, 1986).

An important feature of the DCT is the notable difference between abstract and concrete language. Concrete language has more access to non-verbal imagery compared to abstract language. For example, the word *flower* may evoke both verbal and nonverbal imagery processors compared to the word *shame*, which is more likely to evoke verbal processors than imagery. The abstract words in this theory tend to depend on a network of verbal associations for its meaning. For example, the word *shame* can be defined as disgrace, humiliation, infamy, and indignity. Although concrete words also depend on verbal associations, it can also evoke nonverbal imagery as a form of meaning. For instance, if one thinks of the word *flower*, he/she has the ability to picture it clearly (color, shape, texture, and various experiences linked to it) thereby making the meaning clearer. The verbal code is able to encode both abstract and concrete words, whereas the imagery code is said to be able to easily encode concrete words. Therefore, concrete language has an obvious advantage over abstract language as it can be easily shown and processed in two codes i.e. dual coding. (Sadoski, 2005).

Many experiments have been conducted to support the DCT. In a study done by Paivio and Yuille (1969), 96 participants were given two learning and recall trials with a list of 79 words. Half of the participants were given the words in a random order, while the other half was given in a syntactic order. After viewing each word, the participants were given four minutes to write down as many words as they remembered. The study found that the recall of concrete words was more

55 than the abstract words supporting the dual coding theory. In a study done by Hargis and Gickling

56 (1978) on vocabulary learning in kindergarteners, the children were shown a set of concrete words

57 and abstract words equal in length and frequency. Each of these words were presented on flash

58 cards and each pronounced and used in a sentence. Two days after training, the children were able

59 to identify the concrete words more than the abstract words. Ten days after the training more than

60 four times as many concrete words were identified compared to abstract words.

61   Similarly, Paivio, Walsh, and Bons (1994) in their study on the effects of concreteness and

62 relatedness of noun pairs and free call, experimented on 76 participants. They were each given one

63 of two lists of words depending on the time of arrival. The lists consisted of 12 abstract, and 12

64 concrete words. After reading the list of words, the participants were asked to write down as many

65 words as they could recall. The results of this experiment showed that concrete words were better

66 recalled than abstract words. There were two parts to this experiment the second experiment was

67 similar to the first that was conducted. The participants in the second experiment were 120

68 undergraduate introductory to psychology students. During the experiment, 24 words (12 abstract

69 and 12 concrete) were presented through a projector to the participants. At the end of the

70 presentation, the students were asked to write down as many words as they can recall. The results

71 of this experiment too shows that concrete words were better recalled than abstract words. This

72 experiment explains the necessity of strong verbal associations for recall of abstract words, and

73 the necessity of high imagery for the recall of concrete words. The results of this experiment have

74 been consistent with the dual coding theory.

75   An experiment conducted by Sadoski, Goetz and Fritz (1993) on comprehensibility,

76 familiarity, memorability, and interestingness of concrete and abstract text was investigated in four

77 experiments. The first experiment explored the comprehensibility, interestingness, memorability

78 and familiarity in concrete and abstract sentences regarding historical figures. The second

79 experiment investigated the immediate and delayed recall of the sentences, while the third and

80 fourth experiments replicated features of experiments one and two. The results of these

81 experiments show that concreteness was the variable most related to comprehensibility and recall

82 of words and sentences. Concrete text was rated as more concrete, more interesting, and more

83 comprehensible than ecologically valid abstract text (Sadoski, Goetz and Fritz, 1993), supporting

84 the dual coding theory.

In Paivio (1970) on the functional significance of imagery showed a comparison of effects of the abstractness and concreteness of nouns in paired associative learning between children (from grades four to eight), and adults. The results showed that concrete language has a natural advantage over abstract language.

Many research had been conducted on the concreteness of abstract and concrete words. One such study is one done by Corkill, Bruning and Glover (1988) on the effects of abstract and concrete organizers on students' memory for prose. There were two experiments conducted, the first experiment compared three conditions; a) students were required to paraphrase an abstract organizer before reading a passage, b) a concrete organizer before reading a passage, and 3) a control condition which did not require the students either before reading. The second experiment was replicated on the first experiment except, a text book chapter was used as the material to be used. The students were tested on free recall of the material. The results in this experiment showed that students who paraphrased the concrete organizer recalled considerably more of the content given, compared to others.

An experiment carried out by Schultz and Woodall (1980) on 126 third and fourth grade students on pictorial and narrative learning mediators, the children were randomly assigned into three presentation conditions: control group, narrative mediator, and pictorial mediator. They were presented with ten words to study in four minutes. The control group was shown the first poster containing words and was asked to look at the words while the narrative mediator group was asked to write down a story using (if possible) all the words in the poster. The pictorial mediator group was given a second poster containing both pictures and words, where they were told to look at all the pictures. At the end of four minutes the posters in each condition was removed and the stories of the narrative mediator group was collected. One minute after, the children were asked to write down as many words as they remember. The results of this experiment showed that there was a higher recall of words in the pictorial mediator group, which recalled an average of 8.93 words compared to the narrative mediator group and control group which recalled an average of 6.05 and 6.58 words respectively supporting the dual coding theory.

It is evident that the dual coding theory has been a popular area of research for many decades. Although there were many contradictions over the past years, majority of research supports the theory of dual coding. This theory is applicable in daily activities mainly in the education sector where it has proven to improve skills such as reading and writing. It is also

116 applicable in remedial literacy education, where these principles were used to help those with
117 learning disabilities (Paivio, 2006). The present study on DCT was conducted using participants
118 from Asian ethnicity. 298 subjects were given a set of 30 words (either concrete or abstract) to
119 memorize in 60 seconds, and the total number of words recalled were recorded according to the
120 number of words given to the participants. We hypothesized that the participants were able to
121 recall concrete words better than the abstract words supporting the previous studies.

122

123   Method

124 **Participants**

125   298 Students enrolled in the bachelor of psychology undergraduate program took part in
126 this study. All participants (127 male, 171 female) were from Chinese ethnicity between 18 to 25
127 of age. The Participants were randomly assigned into one of two groups: group-1, and group-2,
128 which was made up of 149 in each equally. Participants did not receive any incentives for taking
129 part in this study.

130 **Materials**

131   30 concrete words, and 30 abstract words printed on an A4 paper used in this study. Each
132 participant received a sheet depending on the group they were assigned to. A stop watch was used
133 to calculate the time. A filler task (simple algebra) was given in between the study after the
134 memorization. All participants were given a written consent form prior to the experiment; thus,
135 participating in this study was completely voluntary. This study was approved by the HELP
136 University College ethics committee.

137 **Procedure**

138   The participants were divided into two groups: group-1 and group-2. Participants in group-
139 1 were each given a sheet of concrete words, and participants in group-2 were given the abstract
140 words. Participants were given 60 seconds to go through the list of words given to them. At the
141 end of their time limit, participants completed a filler task (a simple mathematical task) for
142 approximately 45 seconds. Then, they were asked to write down as many words from the list they
143 memorized as they recalled in any order. The participants were given 120 seconds to write down
144 the words.

Results

Table 1

Recall of words

	N	*M*	*SD*
Concrete	149	10.213	3.142
Abstract	149	8.898	3.198

The results were calculated based on the number of words written. The mean number of concrete words recalled was 10.213, and the mean number of abstract words recalled was 8.898. The standard deviation for concrete and abstract was 3.142 and 3.198 respectively (table 1). The mean difference was 2.011 equal variances assumed. Levene's test for equality of variances: .089, $p = .69$. The independent samples *t*-test showed a statistically significant difference in recall for concrete and abstract words; $t(301) = 5.12$, $p < .001$ (table 2).

Table 2

Independent samples t-test

t	*df*	Sig.	*M*
5.12	301	$p < .001$	2.011

172   Discussion

173   The results of this experiment showed that the participants were more able to recall

174   concrete words better than the abstract words. The findings support the hypothesis that concrete

175   words are better recalled than abstract words. Thus, showing that concrete words are superior

176   (memorable) to abstract words in free recall and memory tasks.

177   The findings also consistent with past research. The experiment of Paivio and Yuille (1969)

178   where the participants were presented with 79 words in both syntactic and random order to learn

179   and recall showed similar results. The results showed that participants were able to recall more

180   concrete words compared to abstract words. In the study conducted by Hargis and Gickling (1978)

181   on kindergarteners showed similar results where the children were able to identify concrete words

182   compared to abstract words, regardless of the age difference and time interval. An extended study

183   of the same research on middle class children with learning difficulties, have shown similar results

184   to both the Hargis and Gickling(1978) and the present study. The results of the study have shown

185   that children were able to learn concrete words almost 12% faster than abstract words. It was

186   concluded that concrete and high imagery words can be learned more easily compared to low

187   imagery and abstract words, which would need more exposure and use in context (Sadoski, 2005).

188   The same concept is applicable to the results of the current study.

189   Sadoski, Goetz, and Fritz (1993) experiment on comprehensibility, familiarity,

190   memorability and interestingness of concrete and abstract text was yet another interesting study

191   which showed similar results to the current study. This experiment illustrated how concrete words

192   are more comprehensible and easier to recall compared to abstract words. Similarly, the

193   experiment by Paivio (1970) supported the dual coding theory, and the current hypothesis as

194   concrete words were better recalled than abstract words regardless of age limit as it compares the

195   results of adults and children. Although the recall of words in children were much lower than the

196   recall of words of adults, both adults and children were able to recall concrete words than abstract

197   words. Similar results are seen in the experiment carried out by Corkill, Bruning and Glover (1988)

198   on the effects of abstract and concrete organizers on students' memory for prose. It explained how

199   students who paraphrased the concrete organizer was able to recall more words compared to the

200   students who paraphrased the abstract and the rest who were simply asked to read. The experiment

201   conducted by Schultz and Woodall (1980) showed how words assisted with pictures are more

202   helpful in learning as it has a higher recall rate than words. Concrete words are said to evoke verbal

203 processors and imagery which helps one to understand and picture the word and thus retains in
204 memory longer than abstract words.

205   Many researches on the DCT has been tested on all age groups. The current study was
206 tested on participants above the age of 18 with Asian ethnicities. We found similar results as
207 previous studies supporting the DCT. As an application, it is worth mentioning that the future
208 research on DCT can be used to test eyewitness memory (Loftus, 1979; Perera-W.A., 2014; Marsh,
209 2007). Many studies have found inconsistencies with eyewitness testimonies and the cross-race
210 effects (Platz & Hosch, 2006; Pezdek, O'Brien, & Wasson, 2012; Perera-W.A., 2014). As stated
211 earlier (Paivio, 1986) the involvement of logogens and imagens with DCT in eye-witness
212 testimony is yet to be explored. Given the consistent results, future studies can be focused on
213 further identifying the importance of DCT in the area of memory retrieval process.

214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233

234   References

235   Corkill, A. J., Bruning, R. H., & Glover, J. A. (1988). Advance organizers: Concrete versus
236   abstract. *The Journal of Educational Research*, *82*(2), 76-81.

237   Hargis, C. H., & Gickling, E. E. (1978). The function of imagery in word recognition
238   development. *The Reading Teacher*, *31*(8), 870-874.

239   Loftus, E. F. (1979). Eyewitness testimony. Cambridge, MA: Harvard University Press.

240   Marsh, E.J. (2007). "Retelling Is Not the Same as Recalling: Implications for Memory," Curr.
241   Dir. Psychol. Sci., vol. 16, no. 1, pp. 16–20

242   Paivio, A., & Yuille, J. C. (1969). Changes in associative strategies and paired-associate learning
243   over trials as a function of work imagery and type of learning set. *Journal of Experimental*
244   *Psychology*, *79*(3p1), 458.

245   Paivio, A. (1970). On the functional significance of imagery. *Psychological Bulletin*, *73*(6), 385.

246   Paivio, A. (1971). Imagery and Verbal Processes, Holt, Rinehart, and Winston, New York
247   (Reprinted 1979, Erlbaum, Hillsdale, New Jersey).

248   Paivio, A. (1986). Mental Representations. New York: Oxford University Press.

249   Paivio, A., Walsh, M., & Bons, T. (1994). Concreteness effects on memory: When and
250   why?. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *20*(5), 1196.

251   Paivio, A. (2006, September). Dual coding theory and education. In *The Conference on*
252   *Pathways to Literacy Achievement for High Poverty Children* (pp. 1-20).

253   Perera-W.A., H. (2014). The Effects of Memory Conformity and the Cross-Race Effect in
254   Eyewitness Testimony. *Social Science Research Network e-Journal,*
255   http://dx.doi.org/10.2139/ssrn.2732189

256   Pezdek, K., O'Brien, M., and Wasson, C. (2012). "Cross-race (but not same-race) face
257   identification is impaired by presenting faces in a group rather than individually.," Law Hum.
258   Behav., vol. 36, no. 6, pp. 488–495.

259   Platz, S. J., and Hosch, H. M. (2006). "Cross-Racial/Ethnic Eyewitness Identification: A Field
260   Study," J. Appl. Soc. Psychol., vol. 18, no. 11, pp. 972–984.

261   Sadoski, M., Goetz, E. T., Stricker, A. G., & Burdenski Jr, T. K. (2003). New findings for
262   concreteness and imagery effects in written composition. *Reading and Writing*, *16*(5), 443-453.

263   Sadoski, M., Willson, V. L., Holcomb, A., & Boulware-Gooden, R. (2005). Verbal and
264   nonverbal predictors of spelling performance. *Journal of Literacy Research, 36*, 461–478.

265 Sadoski, M., Goetz, E. T., & Fritz, J. B. (1993). Impact of concreteness on comprehensibility,
266 interest, and memory for text: Implications for dual coding theory and text design. *Journal of*
267 *Educational Psychology*, *85*(2), 291.

268 Schultz Jr, E. E., & Woodall, K. E. (1980). A comparison of pictorial and narrative learning
269 mediators in lower-and middle-class children. *The Journal of General Psychology*, *102*(1), 147-
270 152.

271

272

273