IBO
International Baccalaureate
Form 3/CS
Internal assessment: group 3
Individual candidate cover sheet

SUBMIT TO: MODERATOR ARRIVAL DATE 20 APR / 20 OCT SESSION: 2007

SCHOOL NUMBER

SCHOOL NAME: ....

· *Type or write legibly using black ink and retain a copy of this form.*
· *Attach one completed copy of this form to the work of each candidate represented in the sample.*

SUBJECT: _Psychology_ LEVEL: _Standard_

CANDIDATE NAME: _

CANDIDATE SESSION NUMBER:

TITLE(S) AND DATES OF WORK: (complete if appropriate)

(1) The effects of imagery and rehearsal on
(2) memorizing and recalling word-pairs;
(3) an experiment investigating the
(4) dual-coding theory of cognition.

Teacher declaration
To the best of my knowledge, the material submitted is the authentic work of the candidate.

Signature of teacher: .... Date: 4/4/07

Types of work undertaken (to be completed by teacher)
(for example, written assignment/essay/case study/fieldwork/portfolio/photography/video/computer)

Geography SL: note whether the one piece is *fieldwork* or a *research assignment* and to which theme it is linked.

Business and management SL: note which of the prescribed list of topics/subtopics (*Business and management guide, February 2000, page 45*) the subject matter of the investigation is linked

Replication of a psychology experiment.

Other relevant information (where appropriate)

Teacher support (where a candidate could not have completed the work without substantial support, please indicate)

International Baccalaureate

Form 3/CS (reverse)

SCHOOL NAME: ..

SUBJECT: _Psychology_ LEVEL: _Standard_

CANDIDATE NAME: _

ASSESSMENT CRITERIA: *Complete the boxes for the appropriate subject*

	A	B	C	D	E	F	TOTAL	
	0–2	0–5	0–4	0–5	0–2	0–2	0–20	
History HL and SL:								
	0–5	0–5	0–5	0–10	0–5		0–30	
Geography HL:								
Geography SL: (Note: Criterion B has two alternatives—fieldwork or research assignment)	0–5	0–5	0–5	0–10	0–5		0–30	
	0–2	0–4	0–5	0–5	0–4		0–20	
Economics HL and SL:								

	A	B	C	D	TOTAL	MEAN TOTAL
	0–5	0–5	0–10	0–10	0–30	0–30
Philosophy critical analysis:						
	0–5	0–5	0–10	0–10	0–30	
Philosophy philosophical dialogue:						

	A	B	C	D	E	F	G	TOTAL
	0–5	0–2	0–2	0–2	0–4	0–8	0–2	0–25
Psychology HL:								
	0–2	0–2	0–2	0–2	0–4	0–6	0–2	0–20
Psychology SL:	1	1	2	2	2	4	1	13
	0–2	0–5	0–3	0–5	0–3	0–2		0–20
Social and cultural anthropology HL:								
	0–4	0–4	0–4	0–4	0–4			0–20
Social and cultural anthropology SL:								
	0–4	0–5	0–7	0–5	0–4			0–25
Business and management HL:								
	0–4	0–4	0–4	0–4	0–4			0–20
Business and management SL:								
	0–6	0–4	0–8	0–5	0–2			0–25
Islamic history HL and SL:								
	0–4	0–5	0–5	0–5	0–2	0–4		0–25
ITGS HL portfolio piece 1:								
ITGS HL portfolio piece 2:								
ITGS HL portfolio piece 3:								
ITGS HL portfolio overall marks								

	G	H	I	J	K	L	M	TOTAL
	0–3	0–4	0–10	0–6	0–3	0–6	0–3	0–35
ITGS SL project:								

	N	O	P	Q	R			TOTAL
	0–3	0–4	0–4	0–7	0–2			0–20
ITGS HL portfolio extension								

The effects of imagery and rehearsal on memorizing and recalling word-pairs; an experiment investigating the dual-coding theory of cognition.

Subject and Level: Psychology SL

Date of Submission: March 21, 2007

Word Count: 1583 words

Abstract

The dual-coding theory of cognition states that there are two different, but highly connected coding systems for information in memory: linguistic and nonlinguistic. The aim of this study was to replicate Paivio's 1971 experiments to demonstrate that imagery is a mnemonic device that makes it easier to memorize and recall word-pairs than rehearsal.

This experiment used a repeated measures design and tested participants individually. The independent variable was the mnemonic device used to memorize each word-pair and the dependent variable was the number of word-pairs correctly recalled. Participants were an opportunity sample of fifteen high-school students ages 16-18. Five participants were males and ten were females. Each participant was given the same twenty word-pairs to memorize. Ten of the word-pairs were to be memorized by using imagery and the other ten word-pairs by using rehearsal. After being asked to memorize all twenty word-pairs, participants were asked to recall the corresponding word when given the first word of each word-pair.

The results agreed with the postulates of the dual-coding theory. More word-pairs that were memorized using imagery were recalled than the word-pairs memorized using rehearsal. These findings correspond with the dual-coding theory because it was demonstrated that nonlinguistic coding is more easily recalled than linguistic coding.

Table of Contents

Introduction

The cognitive approach of psychology studies the mental processes of people. Memory is a major area of research in this perspective. The proposal of the dual-coding theory (Paivio, 1971) sparked a new interest in studies of memory. Allan Paivio theorized that human cognition is unique in that it uses two different codes to represent and store information in memory; one code specialized for nonlinguistic objects/events (imagery code) and the other specialized for all things linguistic (verbal code). Paivio also proposed that there are two special chunk-like stores of memory specialized as well, imagens for the imagery code and logogens for the verbal code, each hypothesized to be stored and organized in a different manner. It is postulated that the imagery code is more easily recalled because visual images engage multiple associations with various other words and images, making it's coding much more elaborate than the verbal code's. Mnemonic devices are techniques used for improving memory, such as imagery and rehearsal. For the technique of imagery, words are mentally visualized with pictorial associations (imagery code) and for rehearsal, words are repeated over and over again (verbal code).

In one of the experiments from Paivio's 1971 study, participants were shown a sequence of images (half words and half pictures). They were then asked to recall what they had seen in either the order that they had appeared or in any order that they wanted. When recalling images in any order that they wanted, participants recalled more pictures than words. When recalling images in the order that they had appeared, more participants recalled the words sequentially than the pictures. Overall, more picture images were recalled than images of words. These results supported Paivio's theory that linguistic and

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nonlinguistic items are processed and stored differently. Also, the results demonstrated that imagery/nonlinguistic codes are more easily recalled than the verbal/linguistic codes.

Modeled after Paivio's study mentioned above, this experiment's aim is to demonstrate that imagery is a mnemonic device that makes word-pairs easier to memorize and recall than rehearsal does.

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Method

Design

This experiment used repeated measures because the ability of participants to recall word-pairs using two different mnemonic techniques was tested. The repeated measures design was used because it allowed researchers to compare participants' word-pair recall after memorizing using one mnemonic technique (imagery or rehearsal) to their word-pair recall using the other technique. The independent variable was the two mnemonic techniques used and the dependent variable was the number of word-pairs correctly recalled.

Controls implemented include the amount of time given to memorize each word-pair, a standard list of twenty word-pairs to be memorized, the individual testing set-up, the random selection of participants, the randomized order of memorization techniques to be used, the randomized order of word-pairs given, and the standardized instructions read to each participant. Participants were tested individually to minimize distraction from other participants and to eliminate the possibility of sharing answers from others. To control order effects, the technique used to memorize each word-pair was randomly selected and the order in which the word-pairs were given was randomized as well. The confounding variable among participants was their general memory ability. Because repeated measures were used to compare one each participant's performance against their own, the participants with a high memory ability slightly skewed the mean calculations for average number of word-pairs memorized since their supposed high number of word-pairs correctly recalled was being averaged in with the other participants' number of word-pairs correctly recalled. Also, noise was another variable that could not be

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controlled by the experimenter. The noisy environment may have caused distraction to participants and may have disabled them from fully focusing on the experiment.

Informed consent was obtained from all participants prior to experimentation. Each participant was made aware that they could withdraw from the experiment at any time. Confidentiality was maintained by assigning each participant a number to be used as identification and for data analysis. An oral debriefing was given about the purpose of the experiment after testing was complete.

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Method (cont.)

Participants

Fifteen participants, ages sixteen to eighteen, were used as participants in this study (five males and ten females). All participants come from different ethnic backgrounds and all are students in grades eleven and twelve at L   P   A   ,, an academic public high school in F   P   , Florida (United States). Seven of the participants came from a Marine Science class and the other eight participants came from an Advanced Placement English class. These participants represent an opportunity sample because the researchers were only able to use participants from classes that were available for testing (due to scheduling conflicts). Each student in the two classes tested was assigned a number on a slip of paper placed on their desk. Participants were randomly selected by a researcher reaching into a cup and choosing a slip of paper with one of the student's numbers on it (all students' numbers were written on slips of paper inside the cup). The student with that corresponding number was designated a participant. The results of this experiment cannot be generalized to the worldwide population because the participants come from a specific population of teenage students in the United States.

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Method (cont.)

Materials

The materials used in this experiment include the numbered slips of paper and a cup (for designating students as participants), pre-made blank testing sheets for recording data (see Appendix I), a timer, twenty standard word-pairs to be tested (see Appendix II), standardized instructions (see Appendix III), and debriefing notes (see Appendix IV).

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Method (cont.)

Procedures

A list of twenty word-pairs (see Appendix II) was scrambled and put into random order for fifteen testing sheets (see Appendix I). Then, the two mnemonic techniques were scrambled and placed into a random order on each of the testing sheets. Participants were randomly selected, one at a time, to participate. They then were taken to a separate location for experimentation. Standardized instructions (see Appendix III) were read to each participant. Next, a memorization technique was given, followed by the word-pair to be memorized. The participant was given ten seconds to memorize the word-pair using the given technique. This occurred nineteen more times until the participant had been given all twenty word-pairs. Then, each participant was told to count backwards from ninety-nine as the experimenter timed them for thirty seconds. After that, the first word of each word-pair was given, and each participant was asked to give the corresponding word to complete each word-pair. After testing was completed, each testing sheet was scored and the number of correctly complete word-pairs was added up, noting how many were completed using each of the two memorization techniques. Finally, data was analyzed and an oral debriefing (see Appendix IV) was given to participants about the purpose and results of the experiment.
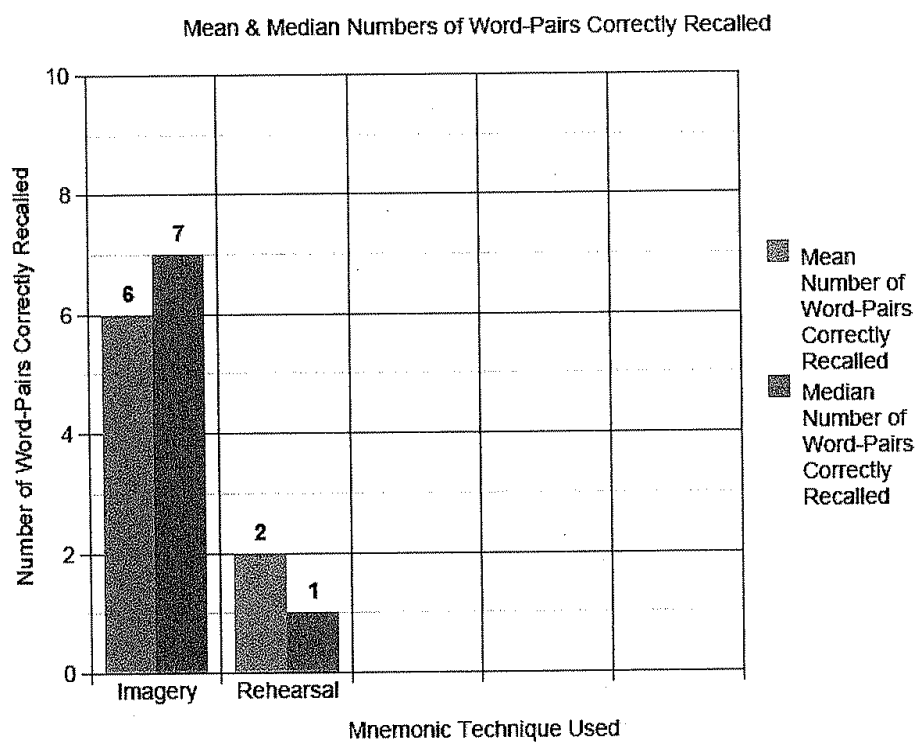
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Results

Mean & Median Numbers of Word-Pairs Correctly Recalled

Mnemonic Technique Used to Memorize Each Word-Pair	Mean Number of Word-Pairs Correctly Recalled*	Median Number of Word-Pairs Correctly Recalled*
Imagery	6	7
Rehearsal	2	1

*Figures rounded to nearest whole number

Figure 1

Mean & Median Numbers of Word-Pairs Correctly Recalled

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The total number of word-pairs given to be memorized was 20 (10 to be memorized by imagery, 10 to be memorize by rehearsal). The mean number of word-pairs correctly recalled after using the mnemonic technique of imagery to memorize the word-pairs is 6. The median number of word-pairs correctly recalled after using imagery is 7. The mean number of word-pairs correctly recalled after using the mnemonic technique of rehearsal to memorize the word-pairs is 2. The median number of word-pairs correctly recalled after using rehearsal is 1. All figures were rounded to the nearest whole number because partially correct/complete word-pairs do no exist.

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Discussion

The experimenters found that the results of this experiment did support the aim of the study. Like Paivio's 1971 study, it was found that imagery used as a mnemonic device makes memorizing and recalling word-pairs easier than rehearsal does. More word-pairs were correctly recalled after being memorized using the imagery technique because the imagery/nonlinguistic code creates many associations, making it easier to recall particular parts of that image. Few word-pairs were correctly recalled using the technique of rehearsal to be memorized because rehearsal codes under the verbal code, which makes much fewer associations than the imagery code does. Therefore, it is not as easy to recall information stored under the verbal code as it is to recall information stored under the imagery code.

Strengths in this experiment include the repeated measures design which contributed to many controls. The standardized word-pairs used, the standardized instructions, and the standard amount of time allotted to memorize each word-pair gave the experimenters almost complete control over the experiment. This strength of controls made data more consistent and accurate. Extraneous and confounding variables in this experiment were the participants' general memory ability and the noise factor. A participant having a high memory ability obviously may have affected results because that participant would be more apt to memorize more word-pairs than average, regardless of mnemonic technique used. The noise in the testing location may have distracted participants, disabling them from fully concentrating and recalling word-pairs. To eliminate this extraneous variable, testing could be done in a private room without other

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people around. With that improvement no possible noise could distract the participant and they would have the potential of giving the experiment their full focus.

To further investigate the dual-coding theory, participants could be given items to memorize visually through images like Paivio's original study did. The use of visual imagery in memorization could have a different effect on the results than using mental imagery to memorize word-pairs did. Also, because each participant was tested by one of the three experimenters, to make testing more consistent, the same experimenter should test all participants.

Overall, this experiment demonstrated that due to the dual-coding theory, imagery is a mnemonic technique that makes memorizing and recalling word-pairs easier than rehearsal does, much like Paivio found in his 1971 study.

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References

Maglennon, K. (1992). *Essential Practical Psychology*. Great Britain: Cambridge University Press. (pp. 85-104).

Paivio, A. (1971). *Imagery and Verbal Processes*. New York: Holt, Rinehart & Winston.

Ruddell & N. J. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed.) (pp. 1329-1362). Newark, DE: International Reading Association.

Sadoski, M., &Paivio, A. (2001). *Imagery and Text: A Dual Coding Theory of Reading and Writing* . Mahwah, NJ: Lawrence Erlbaum Associates.

Appendix

Appendix I – Blank Testing Sheet

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Participant #_____

Memorization Technique Used	Word-Pair	Response	Correct/Incorrect
1			
2			
3			
4			
5			
6			
7			
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19			
20			

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Appendix II – List of 20 Standard Word-Pairs

1. rabbit-house

2. boy-rope

3. shoe-mountain

4. table-skull

5. doctor-flag

6. book-fish

7. apple-party

8. lamp-bird

9. heart-water

10. ladder-baby

11. teacher-pudding

12. mule-dress

13. kettle-fox

14. snake-fire

15. tree-queen

16. flower-money

17. harp-elephant

18. bear-candle

19. clock-moon

20. horse-potato

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Appendix III – Standardized Instructions

<u>Standardized Instructions To Be Read To Each Participant</u>

The purpose of this experiment is to investigate two different techniques for memorizing word-pairs. I will read you a list of word-pairs, one at a time. Your task is to learn the pair so that later, when I give you the first word of the pair; you will be able to tell me the word that goes with it. There are two memory techniques I want you to use. For some pairs you are to repeat the two words aloud for ten seconds. For other words you are to remain silent for ten seconds while forming a mental image or picture in which the two words are associated or interacting in some way; the more vivid or unusual the better. For example, if I gave the word-pair "clown-bicycle" the mental picture you would form might be of a clown riding a bicycle. Just before I give you each word-pair, I will tell you which method of memorizing to use by saying either "repeat" or "image". After you have been given all twenty word-pairs, I will say "count", and you are to count backwards from ninety-nine aloud until I tell you to stop. I will then test your memory by saying the first word in each pair and you have to try to tell me the word that goes with it. Remember, you may withdraw from this experiment at any time by simply notifying me. If you forget what to do, let me know and I will repeat the instructions for you. Any questions?

<u>Script</u>

Okay, the first technique to be used is _____.

The first word-pair is _____.

Now, use _____.

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The word-pair is _____.

<u>If they forget:</u>

I will tell you which method of memorizing to use by saying either "image" or "repeat".

If I say "image", I want you to form a mental picture of the word-pair for ten seconds. If

I say "repeat", I want you to repeat the word-pair aloud for ten seconds.

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Appendix IV – Debriefing Notes

<u>Standardized Debriefing</u>

First the researchers would like to thank those of you who chose to take part and participate in the Imagery versus Rehearsal experiment. The aim of the project was to demonstrate and investigate the effectiveness of the mnemonic devices imagery and rehearsal as methods of recalling word pairs. The researchers found that the word pairs whose accompanying mnemonic device was imagery were more often accurately recalled. These results of the replicated experiment paralleled those which Allan Paivio found in his original experiment conducted in 1971. The researchers for this replicated experiment found that a mean of 8 word pairs that utilized the imagery recall method were recalled accurately. However the mean word pairs recalled correctly by the rehearsal mnemonic device was only 2. Thank you again for participating in the experiment, your contributions were very much appreciated.

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Appendix V – Raw Data

Participant #	Number of Word-Pairs Correctly Recalled Using Imagery	Number of Word Pairs Correctly Recalled Using Rehearsal
Participant #1	5	2
Participant #3	9	1
Participant #4	2	1
Participant #5	7	1
Participant #7	9	2
Participant #8	7	3
Participant #9	4	1
Participant #11	7	1
Participant #12	6	1
Participant #13	8	7
Participant #14	10	5
Participant #16	4	1
Participant #18	6	1
Participant #19	9	4
Participant #20	2	1

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Appendix VI – Formulas & Calculations

Mean = total number of word-pairs correctly recalled

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total number of word-pairs

For Imagery: $\dfrac{5 + 9 + 2 + 7 + 9 + 7 + 4 + 7 + 6 + 8 + 10 + 4 + 6 + 9 + 2}{150} = \dfrac{95}{150}$

$\dfrac{95}{150}$ = .633 x 100%   =   6.333 which rounds to 6

For Rehearsal: $\dfrac{2 + 1 + 1 + 1 + 2 + 3 + 1 + 1 + 1 + 7 + 5 + 1 + 1 + 4 + 1}{150} = \dfrac{32}{150}$

$\dfrac{32}{150}$ = .213 x 100%   =   2.133 which rounds to 2

Median = the middle number that divides the upper half of data

from the lower half of data

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– Psychology Experiment Participant Consent Form 2007

Mrs. _____ s Psychology students will be conducting experiments and your teacher has agreed to allow you to participate during their class period. We hope you will agree to be part of this activity. **Please read, then complete and sign the bottom portion of this form to indicate your willingness to participate.** Thank you!

Teacher_____ Period_____

I give my *informed consent* to participate in this research, based on the following conditions:

- I will be informed about the nature of the project.
- I understand that I have the right to withdraw from the research at any time, and that any information/data about me will remain confidential.
- My anonymity will be protected as my name will not be identifiable.
- The research will be conducted so that I will not be demeaned or experience stress in any way.
- I will be debriefed once all data has been collected, and will have the opportunity to learn the results of the experiment once the data has been analyzed.

Please **Print** Your Name: _____ Your Age: _____

Signature of Student:_____Date:_____

If Student is under age 16:

Print Parent/Guardian Name:_____

Signature of Parent/Guardian:_____

Thank you for your support of this important endeavor!

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