



Can Mental Imagery Predicts Reading Comprehension?

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Abstract

The current study aimed at investigating the predictive ability of mental Imagery patterns on reading comprehension among students of the basic stage in Jordan. To achieve the aim of the study, 319 students chosen randomly from (6291) in Al-Quesmeh area in Amman, Jordan. In addition, the Sheveland (1992) mental imagery scale and the reading comprehension test were prepared and validated. The results of the study indicated that visual, auditory, olfactory and feelings Imagery predicted significantly reading comprehension.



Article History

Received: 06 September 2018
Accepted: 01 October 2018

Keywords

Basic stage in Jordan;
Mental imagery patterns;
Predictive analyses;
Reading comprehension.

Introduction

The mental imagery is one of the most important processes that are built upon information representation in the cognitive system, it's a familiar aspect of most people's everyday experience. Despite the familiarity of the experience, the precise meaning of the expression 'mental imagery' is remarkably hard to pin down. When talking about visual and verbal imagery, coding and construction of visual and verbal images, it is necessary to refer to the theory of Paivio, known as Dual-code theory. This theory briefly refers to the mechanisms of coding in the brain, consisting of two components, namely the visual and verbal components. Paivio's theory also

suggests that Dual-coding is also concerned with coding concepts.⁶


Kosslyn's researches via (F-MRI) also indicated that mental imagery occurs in neural connections in the brain. The left half of the brain is concerned with coding and generating mental images based on categories, while the right half is better to encode specific examples.¹⁶

Mental Imagery was defined as an ability to represent events and stimuli,¹⁸ while others²² supposed that mental imagery expresses the individual's experience of events fairly similar to

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Doi: <http://dx.doi.org/10.12944/CRJSSH.1.1.02>

the perception of faces, events or scenes, but the difference between them is that objects in mental imagery do not exist before the senses.

Kosslyn demonstrated that the subjective sizes of mental images measurably affect the times it takes to inspect and report on particular details of imagined objects. The presence of larger features of an object could be reported more quickly than smaller features. These experiments provided further evidence for the notion that imagery is a generic form of mental representation, with distinct properties from linguistic or purely conceptual representations.¹⁶

A recent research suggested that there is a set of main characteristics that characterize mental Imagery, which can be described as multi-sensory, and derives its sources of memory according to the classification of the five senses (sight, hearing, smell, touch, taste), which can be classified into multiple types, mental imagery with some neural foundations, which refers to the role of biological and brain bases in its composition, and it also affects and is influenced by various cognitive and mental processes.¹⁷

Mental images can be classified upon many researchers to different types:^{6,18,19,7-17-5}

Visual Imagery

It evokes the characteristics of the shape such as: circle, square, triangle, height, width, depth, etc.

Auditory Imagery

It distinguishes the characteristics of the intensity of the sound, its intensity, strength, and distinguish it from other sounds.

Kinesthetic Imagery

The characteristics of the texture, such as: softness, roughness, hardness, scalability, etc.

Gustatory Imagery

It evokes the characteristics related to taste, such as sweetness, salinity, bitterness, and acidity.

Olfactory Imagery

Which evokes characteristics related to odors, such as odors, harmful smells, attractive and others.

Mental imagery is used to develop learning skills. The use of mental imagery also helps in the success of learning motor skills, so there is a positive relationship between mental Imagery and acquisition of new skills.⁷ It also helps students to understand, recognize the symbols in different ways (visual, auditory and others), make them meaningful and linking them to the cognitive content of the individual.⁴

Reading comprehension is the basis of the reading process, and there is no reading value without it.⁸ Reading comprehension was defined as the process of quoting the explicit or implicit meaning of written or spoken material, the main interest of the reader is to narrow the gap between his previous knowledge and text information,¹³ and it was believed that reading comprehension is a complex process, involving linking the information revealed by the text with the reader's previous experiences.²¹

The reading comprehension includes hierarchical levels. It was classified into three levels; the literal level, the interpretive level and the critical level.³ Others classified reading comprehension into four levels:⁹

Literal level

Refers to the literal knowledge of sentences and words.

Gross level

Refers to quick reading to identify text meanings.

Critical Level

Expresses the ability of the reader to practice the skills of criticizing the writer with comparable texts.

Analytical Level

Refers to the understanding of implicit meanings not expressed in the text and understanding beyond the text and its aims.

Mental imagery affects the perception of different situations, experiences and events, as it constitutes the main part of the cognition process. Therefore, it affects the process of reading comprehension related to the ability to absorb texts and to understand the different relationships between events.⁴ Reading

comprehension is a mere understanding of the facts contained in the written symbols, but is seen as a mental activity of multiple dimensions that involves the formation of mental images identical to the image.¹¹ A recent study confirmed this that reading comprehension is a cognitive process based on understanding the meaning of the word, sentence and paragraph, the realization of linguistic objects and visualize it in a mental way to indicate what is stated in the text.²

In addition, reading comprehension has a special psychological nature that indicates that it is an active process involving various mental functions (recall, analysis, criticism and conclusion). As in problem solving, it develops over age from basic learning stage because they develop the ability to use visual symbols during the course of cognitive development. Also, mental imagery skills involve using different tools including meanings, words and numbers, including memories, signs, expressions, gestures and maps. Therefore, one of the most important mental activities that are indispensable for reading comprehension is mental imagery. It is indispensable to read in order to understand texts about the perception of events and processes and represent the images that pass through them. The ability of mental imagery is necessary to represent the form of words, letters, the text enriches and prepares a basic building block in its components.²²

Few studies addressed the relationship between mental imagery and reading comprehension. Generally, these studies showed a statistically significant relationship between mental imagery and reading comprehension. Reading attitude and vividness of mental imagery were significant predictors for students' reading comprehension competencies.¹⁵ Also, mental imagery has a significant effect on reading comprehension process.¹² A relatively low but significant correlation between reading attitude and mental imagery was established.¹⁰ No direct studies addressed the predictive ability of mental imagery on reading comprehension.

The focus of this research was the relationships between mental Imagery patterns (Visual, auditory, kinesthetic, gustatory, olfactory, feelings and

movement) and reading comprehension among students of the basic stage in Jordan.

Problem of the Study

Previous studies that examined reading comprehension showed marked weaknesses and shortcomings in students' ability to master their skills. Weakness in reading comprehension is a major cause of school failure which affects self-image of the students and their sense of self-efficacy.²⁶ In addition, it was noted that students with language impairment problems showed problems with mental imagery skills and needed training strategies to develop them.¹⁴ Furthermore, it was suggested that mental eye training would develop reading comprehension skills.²⁵

Despite the obvious importance of the problem of reading comprehension, however, the follower of the educational reality in schools in general is perceived as a clear weakness of the learners and there is a neglect of the levels of absorption, especially the higher ones, which leads to the learner's sense of failure, which causes the low educational outputs.

Jordanian educational system has been facing so many problems in term of low intended learning outcomes including reading and writing. Also, based on the researchers' own observations to various shortcomings and weaknesses in the level of comprehension of students at all levels, the present study aims at measuring the predictive ability of mental Imagery patterns (Visual, auditory, kinesthetic, gustatory, olfactory, feelings and movement) in the level of reading comprehension by answering the following main question:

- Can mental Imagery (Visual, auditory, kinesthetic, gustatory, olfactory, feelings and movement) significantly predicts reading comprehension among students of the basic stage in Jordan?

Significance of the Study

Previous research studied various factors affecting reading comprehension however; few studied have tried to explore the relationship between mental images and reading comprehension, especially in the Jordan and the region. Results of the current

study could encourage teachers to use mental activities and methods that could enhance and develop reading comprehension. In addition, the results could give direction to curricula developers to include mental images activities in order to develop reading comprehension levels.

Definition of Terms

For the purpose of this study, mental imagery was defined as the ability to visualize events and stimuli in the mind and in the absence of sensory stimuli in different situations and to rotate and control them.¹⁸ The mental imagery scale will provide seven sub-scores describing vividness of mental imagery (Visual imagery, auditory imagery, kinesthetic imagery, gustatory imagery, olfactory imagery, movement imagery, feelings imagery).

Reading comprehension was defined as the ability to process text, understand its meaning, and to integrate it with what the reader already knows.²³ The reading comprehension test will provide four levels describing reading comprehension ability (Literal level, gross level, critical level and analytical level).

Method

The sample of the Study

A sample of 319 male students from the 7th grade of basic school (Al-Quesmeh Area in Amman, Jordan) has been chosen randomly.

The Study Tools

Mental Imagery Scale

To gather data for the scores of mental imageries, the researchers reviewed previous studies and scales.^{8, 20, 24} The Sheveland scale²⁰ was chosen, translated and modified to fit the present population. The new mental imagery scale consists of 28 self-report items using 5-point Likert-type responses that range from (always, often, sometimes, rarely, to never). The items were distributed into seven dimensions each containing (4) items (visual imagery, auditory imagery, kinesthetic imagery, gustatory imagery, olfactory imagery, movement imagery, feelings imagery) based on the classification of Sheveland (1992).

The validity of the Scale

The scale was presented to a panel of 13 psychologists (educational and cognitive psychologists) who volunteered to judge the scale in term of goals, dimensions, and language. Based on the request of 80% of the judges, five items were modified. To ensure construct validity of the scale, the new scale was distributed to a sample of 45 students. Correlations between item scores and subscales scores were calculated. These correlations ranged between .24 to .69 which indicate a good construct validity of the scale.

The Reliability of the Scale

To ensure the reliability of the scale domains, the researchers used data from the validity sample and repeated the test after 2 weeks. Two measures were calculated in order to test stability reliability. Also, Cronbach's alpha for internal consistency was calculated. Cronbach values ranged from .67 to .83 and Pearson values ranged from .60 to .88 which were considered good indicators of reliability of this scale.

Reading Comprehension Test

For the purposes of the current study, the researchers constructed a reading comprehension test by looking at research and studies that dealt with reading and reading comprehension skills for the basic stage^{3,9,14} and reviewing the objectives of teaching reading in the basic stage as defined by the Ministry of Education in Jordan.

Three texts were extracted from outside the curriculum in accordance with the level of mental and age of the students in the seventh grade. Based on the three texts, a 30 multiple choice questions were drawn representing four levels of reading comprehension (Literal level, gross level, critical level and analytical level).

The validity of the test

Content Validity

The reading comprehension test presented to (9) arbitrators in order to judge the suitability of the test questions for the students in term of language, representations of the text, and the four domains of reading comprehension.

Construct Validity

The test was administered to a sample of 46 students from outside the study sample and the correlation coefficients between the item questions scores and domain scores ranged from (0.22 - 0.68) and the item questions scores and the test total score ranged from (0.39 - 0.83) which are acceptable values for the purposes of the current study.

Difficulty and Discrimination Coefficients

The average of the difficulty coefficients for the total score of the reading comprehension test was (0.51). There were no items with a coefficient of difficulty greater than 0.80 or less than 0.20 and there were no discrimination coefficients less than 0.25 except the fifth item, (0.23) and the ninth item (0.23) which is a low discrimination coefficient, so these two items were deleted.

The Reliability of the Test

To ensure the reliability of the test, the researchers used data from the validity sample and repeated the test after 2 weeks. Two measures were calculated, Cronbach’s alpha for internal consistency and Pearson correlation equation for stability reliability. Cronbach values ranged from .63 to .77 and Pearson values ranged from .60 to .89 which are considered good indicators of reliability of this test.

Procedures of the Study

The researchers administered mental imagery scale and reading comprehension test to all study sample (n=319). The data entered to (SPSS V.23) and multiple regression used to estimate the relationship between mental imagery patterns and reading comprehension among students.

Table 1: Correlation between mental imagery and reading comprehension

Mental imagery	Literal level	Gross level	Critical level	Analytical level	Reading comprehension overall
Visual	.338	.274	.361	.407	.424
Auditory	.497	.486	.484	.411	.590
Kinesthetic	.459	.424	.418	.348	.518
Gustatory	.394	.424	.393	.327	.485
Olfactory	.423	.454	.397	.333	.508
Movement	.380	.402	.372	.325	.466
Feelings	.405	.425	.466	.321	.512
Mental imagery overall	.528	.527	.527	.446	.638

Results

Before conducting multiple regression analysis, intercorrelations were calculated for mental imagery and reading comprehension and all of their domains. The correlation matrix is presented in Table 1.

The table above revealed significant positive correlations between all patterns of mental imagery and reading comprehension in general and all its domains. Multiple regression analysis was used to test for the predictability of mental imagery (visual, auditory, kinesthetic, gustatory, olfactory, movement

and feelings) on reading comprehension as shown in Table 2.

Results of table 2 showed that four mental imagery patterns predicted significantly scores of reading comprehension. The visual mental imagery explained 34.8% of the variance of reading comprehension while, the other three patterns auditory, olfactory, and feelings explained (4.1%, 1.7%, 1.5%) in order. All four patterns of mental imagery explained (42.1%) of the variance of reading comprehension.

Table 2: Regression analysis of the predictability of mental imagery patterns on reading comprehension

Predictors	R	R ²	F	Unstandardized coefficients		Standardized coefficients		
				B	SE	β	T	p
Visual	.590 ^a	.348	169.45	2.052	.377	.329	5.44	.000
Auditory	.624 ^b	.389	100.51	.930	.359	.152	2.59	.010
Olfactory	.637 ^c	.406	71.69	1.250	.407	.153	3.07	.002
Feelings	.648 ^d	.421	56.97	1.143	.404	.165	2.83	.005

The ability of mental imagery total scores on reading comprehension was also calculated. Results showed that mental imagery total scores predicted (40.7%) of the variance of reading comprehension ($R^2 = .407$, $F(1, 318) = 217.19$, $p < .001$).

Discussion

The results of the study indicated that visual mental imagery came first in terms of predicting reading comprehension (34.8%), while auditory, olfactory, and feelings mental imagery patterns have predicted significantly reading comprehension but with smaller percentages (4.1%, 1.7%, 1.5%), in order. Other patterns including kinesthetic, gustatory, and movement were not significant in predicting reading comprehension regardless of the fact that they were positively correlated to reading comprehension. This indicates the importance of visual, auditory, olfactory, and feelings mental imagery patterns were the most influential in the variation of reading comprehension.

These findings indicate that mental imagery helps students to create images, scenes and events that enable them to understand the content of the text, the overall picture and the overall meaning of it. Also, these images play a large role in deepening the semantics of the words it contains and develop the skill of observation of the contents of the vocabulary and structures.¹⁸

Results can also be explained that mental imagery leads to the use of imagery skills in situations and problems of life and increases their ability to use the imagery in the events. Mental imagery skill development help in the understanding of the

meanings and content that they learn in their lessons and learned from the reading texts that constitute the semantic aspect of reading comprehension.¹⁶

The reading comprehension has a special psychological nature indicates that it is an active process that includes various mental functions (from remembering, analyzing, criticizing and reasoning). It is more like solving a problem, mental imagery is one of the levels of thinking in which the individual uses different tools including meanings, memories, signs, expressions, gestures, and maps. So, it can be said that reading comprehension and mental imagery are concerned with understanding symbols, images, shapes and words.

It is possible to reach the conclusion that mental imagery is necessary for reading comprehension. The ability to visualize is a necessity to represent the form of words, letters, sounds and movements that enrich the text are essential in the formation of its constituents.¹⁷

Based on the findings of the study, the researchers recommend the following:

- Integrating exercises and activities to help students visualize the events of different texts in order to improve their reading comprehension and solve reading problems.
- Hold a training & workshops for teachers in the basic stage to improve their ability to develop the mental imagery among their students.

Acknowledgement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

There is no conflict of interest.

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