JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Relationship between Coding Processes and Working Memory Capacities with reference to a Regional Language (Odia).

Dr.Jayshree Mishra, HOD- Psychology, FM Autonomous College, Balasore

Abstract
According to Alfred Binet intelligence refers to the capacity to comprehend interrelationship between two things, when many other things are present. Therefore an intelligent person can direct things in a successful manner and can criticize and appreciate a thing. The main objective of this study is to find out the interrelationship between simultaneous successive processing strategies and working memory capacities of grade V children of a odia medium school by using odia orthography. The tests were given and results were statistically analyzed.

Keywords: Simultaneous processing, Successive processing, Coding, working memory, Orthography.

Introduction and Review of Literature

The term intelligence is so complex, that it is difficult to give a comprehensive and precise definition of intelligence. Volumes of research on intelligence make it so multidimensional that it becomes difficult to embrace all attributes of intelligence in a single definition. The first idea of defining and measuring intelligence was done by Alfred Binet and according to him "intelligence refers to comprehension, invention, direction and criticism". Intelligence therefore refers to the capacity to comprehend interrelationship between two things, when many other things are present. The clinical research of Luria, a Soviet Psychologist, put much emphasis on the influence of neurophysiology on intelligence. He studied the cognitive processes and function and in human beings and related cognitive processes to different units of the brain. According to Luria the total brain can be divided into three functional blocks.

The first block is related to controlling the tone and maintaining the waking state of the brain. It works in association with the higher level of the cortex, which generally involves upper and lower brain stem, the reticular formation and the hippocampus. The ascending and descending reticular system helps in activating the cortex and subordinating the lower structures in the brain for controlling the problems arising in the cortex.

The second functional unit of brain is responsible for obtaining, processing and storing of information. This block can be subdivided into primary, secondary and tertiary zones. The primary zone receives information, analyze it into elementary components. The secondary zones organize the material and codes it. This coding is of two types, simultaneous and successive. The tertiary zones responsible for the comprehension of logical, grammatical sentence structure and for converting of concrete perception into abstract thinking. Occipital, temporal and parietal lobes of the brain carry out these functions.

The third block of the brain handles the functions of planning and programming of behavior. This portion of the brain regulates and verifies of the most complex forms of human behaviour.Successive processing is the processing of information in a serial order. But it is not totally retrievable at any point like simultaneous processing.

Simultaneous synthesis has three varieties that is direct perception in which the organism is selectively attentive to the stimulus input in the brain.It can be short term or long term and the integration of traces is performed on the basis of criteria, which can be specified either by the organism or an external source. The last variety of clustering is found in complex intellectual processes. Similarly , there are three types of successive synthesis- perceptual, mnestic and complex intellectual. The best example of third variety of successive processing is human speech.

The Model of Simultaneous and Successive Processing

Sechenov, a Soviet Psychologist proposed the concept of simultaneous and successive processing in 1978. According to him, thinking is possible through sensation and it is organized by the psychological structure of the individual. He holds that perception is the combination of both inborn and acquired quality of an individual. Through experience one can increase his vision and auditory power.

Since all the stimuli always do not arrive in an organized manner, so they have to first decomposed and then synthesized into spatial or temporal form. Therefore, first analysis and then synthesis takes place. Immanuel Kant (1933) admitted Sechnov's relevance of sense experience. He considered the spatial and temporal organizations are not really belonging to sensory information. The outer world supplies the stimuli, but person's own mental structure orders them in space and time.

According to Kant a person can perceive colour, taste, smell, sound or touch with the sense of experience, only when they are ordered spatially or temporarily. Kant holds that simultaneous ordering is present in understanding figures and their relations on the other hand successive processing is understood when one processes, events or objects one after another.

In recent years, several tests have been recognized as the measures of the simultaneous and successive processing strategies. The tests used for simultaneous processes generally deal with subject's synthesisation of separate elements into groups. The tests for simultaneous processing are Raven's coloured progressive matrices (Raven, 1956).This test consists of thirty-six items. The subject has to find out the missing portion of each test, out of a number of alternatives. This test is mainly based on analogical reasoning.

Working Memory:

The branch of psychology which studies cognitive processes is known as cognitive psychology, and the modern day study of memory. Since it emphasizes the mental processes involved in storing information and retrieving it from memory, is a part of cognitive psychology. So far as memory processes are concerned, traditionally short term and long term processes, have been identified. Short term memory has an approximate duration of about 30 seconds time span. It holds auditory, visual images and also words and sentences. Information loss from short-term memory is mainly caused by, the interference from forth coming information. As different from these features long term memory has been viewed to have longer duration of storage. The time span has varied from hours to years. Its storage capacity is assumed to be very large. It stores thematically synthesize information. Information loss from long term memory takes place because of faulty organization of the stored material or because of failure of retrieval or because of interference. Thus short term and long term memory processes have been viewed to be two different factors of memory having different features and functions.

During late 1980s researchers in the field of cognition, realized the insufficiently of viewing memory as having long term and short term storage processes, in accounting for different cognitive functions and processes. It was observed that in case of most of cognitive functions, few bits of information need to be retained in memory, for few minutes and simultaneously they need to be symbolically processed. For example, in case of working out an arithmetical problem, bits of information need to be stored and processed simultaneously, over a few minutes span. Then only one can come up with a solution to the problem. Similar is the case with passage comprehension.

Thus, it became imperative that some memory processes be hypothesized performing storage cum processing functions over few minutes span. Thus the concept of working memory was conceived. Different measures of working memory have been and proposed by different researchers.

So far as the contribution of working memory to different cognitive functions are concerned, researchers have observed that working memory contributes significantly to reading processes and reading comprehension (Danneman & Carpenter, 1980), to verbal fluency (Danneman, 1990); to spelling ability (Cochran, 1988); to reasoning and spatial ability (Salthouse Mitchell, Skovronek & Babcock, 1989); and to comprehension (Just and Carpentor, 1992).These researchers show that working memory contribute significantly to almost all the cognitive functions.

So far as reading processes are concerned, it has been observed that they relate to information coding processes on the one hand and to working memory capacity on the other. This implies that coding processes and working memory capacity would also be related. No study has yet attempted to relate information coding processed with working memory capacity. The present study attempted to do so, in the context of Oriya orthography reading.

Oriya is an official recognized language of the Government of India. It has its own writing system. Oriya orthography could be viewed to be an alphabetic; syllabic type of phonetic orthography. Oriya orthography has the feature of an alphabetic type of orthography, a syllabic type of orthography and also a phonetic type of orthography. Thus, the writing system is

alphabetic, syllabic and phonetic. The present study is done in the context of Oriya orthography reading, since studies in this field are lacking and it is necessary to look into reading processes across different orthographies, in order to establish universalities in reading processes across orthography and orthography-specificities in reading processes.

The study aim in to take into account fluent reader of Oriya orthography. This was necessary in order to avoid the impact of imperfect reading on the assessment of working memory capacity and simultaneous successive processing strategies. This study also aimed to partial out the effect of intelligence on the observed relationship between the information processing strategies and working memory capacities. It is possible that intelligence may vary with different habitual modes of information processing and/or working memory capacities. But no observation yet has revealed these facts. Hence, this study aim to assess intelligence while assessing the dependent measures, so that its impact on the observed relationships could be statistically nullified if necessary. The study designed was conducted by taking 50 students from Grade V of primary school of Odisha. Out of 50 students, 25 were boys and 25 were girls, whose mother tongue was Oriya and the medium of teaching was Oriya

Tasks and Tests used:

The following tasks and tests were used in the present study. All the tests were individually administered on all subjects.

Test of Simultaneous Processing:

Test of Figure coping	For this test a book let continuing 10 geometrical figures like triangle, square, rectangle, cylinders and so was presented to the subjects. The subjects were asked to copy the figures as nearly like the model as possible in the blank space given adjacent to each model. Since it was a free hand drawing test, the subjects were restricted to use scale or erasers.	*Scoring*: The scoring of the test is made on 3,2,1,0 points for each item, according to its approximation to the essential features of the figures.
Test of Successive processing:	*Serial recall test*: A nineteen series list of words was presented to each subject. Each series contained 4 words. Out of nineteen series, ten series contained acoustically similar words and other series contained acoustically non similar words. Each subject was asked to recall the words serially immediately after presentation. Here primary importance was given on the serial position of each word in a series.	*Scoring*: The scoring was one mark for each correct word of it is recalled in correct position.
Working Memory (verbal) Test: Test of Reading Span:	This test consists of a number of cards. In each card there will be a sentence. Each sentence ended in a different word. The cards are arranged in three sets, each of two, three, four and five sentences. The subject is asked to read the sentence aloud. As soon as the sentence is read, a second card is placed on the top of the first and the subject has to read the next sentence. This procedure was to continue until a blank card signals that trial has ended. Then the subject has to recall the last word of the sentences in the order in which they had occurred. The number of sentences per set, increase during the course of test. When the subject fails in the first trial, he/she is given the second trial. If she fails, he/she is given the third trial. If the subject fails in all the three trials the test is discontinued. Subject's responses are recorded in the answer sheet for scoring. If he makes the correct responses in one of the three trials, he/she is given the next set.	*Scoring:* The score was the highest number of words, responded correctly in any trial out of three trials each for five sets. For example of a subject correctly responded the words of set 3 in any one of three trials, his/her score is 3.
Working Memory (non-verbal) Test: Counting Dots Tests:	This test consists of two trials for each of two to six cards. In the first set there are two cards, in the second set there are three cards, in the third there are four cards and in the fourth set there are five cards, and in the fifth set there are six cards. In each card, there are a number of yellow and blue dots.	*Scoring:* Hence the score was the highest number of digits responded correctly, out of two

	In each set the subject has to count the number of blue dots. Then she/he has to recall the total number of blue dots present in each card, serially on the order as they are presented to him. In the same way she/he has to cover all the sets. In case he/she fails in the first trial, he/she is shown the same set for the second trial. If he/she answers correctly in that trial, he/she is given the next set of cards. But if the subject fails even in the second trial the test is terminated there.	trials in five sets. The highest score is six. For example if a subject correctly responded the digits of sets of 5 out of 6 without any error in the serial order, his/her score is 5.
Intelligence Test:	*RCPM:* Raven's Progressive Matrices is an widely used non-verbal test of intelligence, originally developed by Raven (1960). It measures the reasoning ability and abstraction ability of children. RPM is of two types, namely: coloured progressive matrices and standard progressive matrices. Coloured progressive matrices is generally used in children whose age range is from 5 to 11 years. The Raven's coloured progressive matrices consists of 36 coloured matrices or designs with a missing point in each. The subject has to select one design from set given alternatives that can be inserted into the missing portion of the matrix accurately. The thirty-six items of the test are grouped into three series, as having twelve matrices of increasing difficulty, whereas earliest series requires the accuracy or discrimination, the later series involves analogies, permutation, alternation pattern and other logical relations. Only the correct responses were scored.	*Scoring:* The maximum score is 36. One mark is given to each correct answer.

Table: Mean $\bar{X}$ and SD for Age,RCPM, Simultaneious successive processing and working memory tests.

Sex Groups	Age in Month	R.C.P.M Score	Time in Second	Coding Process			Working Memory	
				Simultaneious test (Figure, Copying Score	Time in Second	Successive test (Serial Recall Score)	verbal Reading span Score	Non Verbal Counting dots Score
Boys-$\bar{X}$ N=25	123.36	27.48	765.6	17.72	434.4	63.24	3.2	3.72
SD	19.91	4.52	128.73	4.39	70.38	7.68	0.77	0.96
Girls-$\bar{X}$ N=25	121.44	26	777.6	14.44	453.6	62.44	3	3.56
SD	13.25	5.97	111.97	2.8	77.13	2.53	0.56	0.86

Study Findings

Means and standard deviations for different tests and tasks applied, in the sample were obtained. This study shows that boys and girls differed on the dependent measures to some extent. In order to see, if the sex differed significantly from each other on the dependent measures 't' rations were found out. Before finding out the significance of mean differences, 'F' tests were done to look into the homogeneity or heterogeneity of variances.

Study shows that none of the't' test were significant. This means that the sex differences on dependent measures were due to chance variations. The main purpose of the study was to find out of simultaneous successive information processing strategy relate them reveals to verbal and non measure of working memory. Further study shows that RCPM scores correlated significantly with simultaneous and successive processing measures and also with non-verbal measures of working memory. This observation necessitated partialing out the effect of intelligence on the correlation between simultaneous successive processing strategies and verbal non-verbal memory capacities. For this purpose partial correlation techniques was applied following Guilford's model partial correlation is a statistical measure which statistically nullifies the effect of a third concomitant variable on the relationship between two independent measures. It also shows that even after partialling out the

effect of intelligence, information processing strategies have a significant relationship with working memory capacities. This observation is both revealing and interesting.

Conclusion

The study took into account equal number of boys and girls, select randomly from grade V of one of the primary schools of Bhubaneswar, Odisha. It was not known, if boys and girls differ significantly, on the measures. Hence, significance of mean difference, between these two sex groups on the observed measures were tested before pooling the data together. It was observed that boys and girls did not show significant difference on any of the measures, which were being observed. Hence the data of the two groups were pooled together and were treated as a homogeneous set of data during further statistical analysis. The study shows that girls and boys do not differ on information processing strategy, on working memory capacity, or on RCPM.Verbal measures of working memory are not found to be related to any of the information procession strategy. Non-verbal measures of working memory is found to be negatively related to simultaneous processing strategy but positively related to successive processing strategy. Simultaneous and successive processing strategies are found to be positively related. Verbal and non-verbal measures of working memory are found to be negatively related. Finally it can be concluded that the relationships between processing strategies are positive and significant.

References

1. Babcock, R.L Salthouse, T.A. (1990). Effect of increased Processing demands on Age difference in Working Memory,5,421-428
2. Danneman,M. (1990). Working Memory as a predictor of verbal fluency, Journal of Psycholinguistic Research,20.
3. Das, J.P. and SIU.I, (1989) Good and Poor reader's Word Naming Time, Memory Span and story Recall. Journal of Experimental Education,57,101-114
4. Guilford, J.P (1956). The structure of intellect, Psychological bulletin, 53-267-293
5. Luria, A.R.(1966). Human Brain and psychological processes. Newyork: Harper and Row.