

Original Research Article

## **Auditory Short Term Memory and Academic Achievement in Normal School Going Children**

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### **ABSTRACT**

Short-term auditory memory is essential to hold, process, understand and assimilate spoken language. It relates directly to the speed with which one can articulate words, and influences the speed at which children learn new words and learn to read. The aim of the present study was to assess auditory short term memory in normal school going children and to find its influence on their academic achievement. The participants of the study consisted of 60 students in the age range of 7 to 8 years. The participants were divided into two groups based on their academic grade A & C. Digit span and monosyllable span tasks were used to assess auditory short term memory. Results of the study showed significant difference between the two groups on both the tasks indicating the effects of auditory short term memory and academic achievement.

**Keywords:** Short term memory, language, learning, digit span, monosyllable span.

### **INTRODUCTION**

Memory is the retention of information over time. It is the process of encoding, storing and retrieving information. Encoding refers to the active process of putting stimulus information into a form that can be used by our memory system. The process of maintaining information in memory is called storage and the active process of locating and using information stored in memory is called retrieval. A popular model of memory, divides it into three different processes, sensory memory, short term memory and long term memory. <sup>[1]</sup>

The two separate subsystems of short-term memory that have been studied the most, and therefore there is clear evidence for, are, the visual and verbal or auditory short-term memory systems. <sup>[2]</sup>

Auditory memory is one of the most important learning skills. The ability to learn from oral instructions and explanations is a fundamental skill required throughout life. Children with weak auditory learning skills often have difficulty understanding what words mean, and can show a delayed grasp of language. This is because phonics requires auditory short term memory for children to remember word sounds and piece them together to form words. Furthermore, since many children learn to read by being read to, those with problems with auditory learning will likely take longer to learn to read, and these delays may be reflected later in life with poor reading and writing skills

School places many demands on the short term memory systems, especially

short term verbal memory. Children must remember the instructions given to them by their teachers, what they just heard during their class room lectures, discussion and conversations and they just read in their textbooks and on the board or overheard. Majority of children referred for assessment of behavior problems and under-achievement in literacy have also been noted to have functional difficulties with processing auditory information. Although most of these children had normal hearing, many continue to experience functional auditory processing difficulties. Children in the age group of 7 to 8 years have digit span of 4 and sentence length of 11 words. There is wide variation in the short term memory skills of children in the early years at school as measured by digit span and sentence length. [3]

Researchers have reported that children who fail to perform adequately in academics without any apparent limitation had deficits in basic psychological processes. Defects in psychological process which include cognitive abilities in perception, language, memory, attention, concept formation, problem solving, and the like act as intrinsic limitations or deficiencies that interfere with the child's learning. [4] The present study aims to assess the auditory short term memory in normal school going children and to examine its influence on their academic achievement.

## **MATERIALS AND METHODS**

**Participants:** The study comprised of 60 normal school going children in the age range of 7 - 8 years with mean age of 7.2 years. Subjects were divided into two groups, according to their academic achievement. The first group comprised of 30 students with an academic grade A (between 60% & 70% marks) and the second group comprised of 30 students with academic grade C (between 40% & 50% marks). All the participants were

attending regular school with English as the medium of instruction. Participants with middle ear pathology or hearing loss were excluded from the study.

**Materials and Method:** The tasks used to assess the auditory short term memory in the participants were digit span and monosyllable span.

**Digit span task:** The task consisted of digits from 1- 9 .The digit series were arranged in an increasing order of span, from 2 digit to 8 digit span.

**Monosyllable span task:** This task consisted of monosyllables of consonant-vowel (CV) combination. The syllable series were arranged in increasing order of span from 2 syllable to 8 syllable span.

The stimuli for both the tasks were audio recorded in a quiet environment, using Compaq Presario CQ40 laptop. The stimuli were recorded with a carrier phrase "listen and repeat" prior to the each series of stimuli.

**Procedure:** The study was approved by the institutional ethics committee and informed consent was obtained from the participants prior to the study. Hearing screening was performed to rule out the presence of middle ear pathology or hearing loss. The participants were tested individually in a quiet environment with no visual and auditory distractions.

The tasks consisted of two trial items in order to make the participants familiar with test. They were instructed to listen to the recorded stimuli and repeat it immediately after hearing it. After the trial, no further instructions were given for the remaining test. When the participants could correctly recall each series of digits and monosyllables, the next higher series was presented. The procedure stopped at the level where the participants could not recall the complete series of digits and monosyllables. The highest stimuli series which the participants could correctly recall was considered as the auditory digit or syllable span score.

**Statistical analysis:** The data was statistically analyzed using statistical package of social science (SPSS), version 16.0. Independent sample t- test was performed to examine the mean differences between the two groups.

## RESULTS

The present study was conducted with an objective of comparing the differences in auditory short term memory between the students who obtained Grade A and C on a digit span task and a monosyllable span task.

### *Comparison of digit span between students with Grade A & Grade C*

The results of the independent t test revealed that there was significant difference between students with a grade and C grade, with graders obtaining a higher mean score of 4.2 when compared to that of C graders as shown in Table 1.

**Table 1: Mean, standard deviation, 't' and 'p' values of digit span task obtained for students of grade A & C**

Grade	N	Mean	SD	t	p
Grade A	30	4.2	0.6	5.669	0.000*
Grade C	30	3.4	0.6		

(\* p<0.05)

### *Comparison of monosyllable span between students with Grade A & Grade C*

Table 2 indicates significant difference between the students with grade A & C, with grade A students obtaining a higher mean score of 3.8 as compared to a mean score of 3.2, obtained by grade C students.

**Table 2: Mean, standard deviation, 't' and 'p' values of monosyllable span task obtained for students of grade A & C.**

Grade	N	Mean	SD	t	p
Grade A	30	3.8	0.6	4.218	.000*
Grade C	30	3.2	0.5		

(\*p<0.05)

## DISCUSSION

The current study demonstrated poor performance by students with grade C in the digit span task. Children with mixed disorder of scholastic skills showed

poor digit span scores when compared to the unimpaired peers. [5] Students with high performance in standardized achievement test had better digit span score compared to low performers. [6]

A moderate correlation between student's mathematical errors, digit span and visuospatial span in a group of 30 students was reported, wherein subjects with poor short term memory capacity produced more mathematical errors. [7] Researchers have reported low digit span in relation with learning difficulties. A link between low digit span and reading, spelling disabilities has been suggested. [8] A two-digit difference between a "regular" group of students and a "dyslexic" group of students was reported, with the latter group having the lower average. [9]

Children with behavioral and learning difficulties commonly have problems in processing auditory information. Children with auditory processing deficits during their first and second years of schooling using digit span score and / sentence length. These children had poor literacy achievement and attentiveness scores in their subsequent schooling years. The present study also shows a significant difference in digit span score between high performers and low performers, indicating importance of these skills in academic achievement. Also, the low digit span score obtained for Grade C students may indicate a significant difference in the area of auditory processing abilities. Below average scores was found in auditory short term memory task in a group of 30 mathematically gifted children with specific learning difficulties as indicated by poor performance in auditory word span and digit span tasks. [10]

The relevance of auditory/verbal working memory to literacy skills should be obvious - in the same way that it is necessary to hold spoken words in memory in conversation, the child must hold letters and syllables in memory when

decoding words. [11] Short-term memory is the weakest area in both of the auditory and visual perceptual skills, which may explain its role in dyslexia or other specific learning difficulties. Hence the underachievement of C graders in the present study can be attributed to deficit in auditory short term memory and auditory perceptual skills.

## CONCLUSION

In general the present study focused on relationship between auditory short term memory skill and academic achievement. The result revealed that children with poor academic performance have significant deficit in auditory short term memory skill. The study also highlighted the importance of auditory perceptual skills in academic success. The poor score obtained for children in the Grade C group in the present study may reflect deficit in auditory perceptual skill.

The finding of the present study shows significant deficit in auditory short term memory skills in these children. By adopting appropriate teaching strategies, especially rehearsal based training programmes may lead to improved short term auditory memory. Modification of the class room activities like regular repetition and rehearsal, using music & rhythm for learning sequences (times tables, days of week) will aid in improving literacy skills.

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