Original Article

Five Years Old Preschool Children's Motor-Verbal Skills: A Follow-up into the First-grade

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Objective : The major objective of this study was to determine the means and 95% confidence interval of normal 6 years old children's motor-verbal skills. Based on the results of this study we could develop a measure to diagnose abnormal motor skills. In addition, in this follow-up study, we compared the first-graders' motor-verbal skills to their own skills one year earlier.
Method: In this follow-up study, the development of motor-verbal skills was studied in 220 normal readers in the first-grade after 1 year. We administered naming speed test and word and phrase repetition to assess motor-verbal skills. Data were analyzed by descriptive statistic and paired t-test.
Results: The mean of the 6 years old first-graders' speed naming was 87 words per 100 second. In addition, means and standard deviations of word and phrase repetition were 8.41(2.92) and 6.51(1.73) respectively. In addition,, paired t-test showed a significant difference between naming speed, word and phrase repetition first-grade and 5 years old children score(naming speed: $t=10.95$, $p<0.001$, word repetition: $t= 14.23$, $p<0.001$, phrase repetition: $t=12.11$, $p<0.001$) .
Conclusion: In general, 5 years old children's motor-verbal skills significantly improved after one year. Furthermore, the results of this study provide the norm for speech and language pathologists and other professionals. It is important to note that if 5 years old children's motor-verbal skills are under this norm, it will be anticipated that they are at the risk of literacy problem and dyslexia.

Key words: *Child, Iran, Language, Motor skills, Preschool*

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Children with speech and language difficulty often have literacy-problems. These include problems with reading comprehension, reading aloud, spelling and expressive writing. The reverse is also true. Children with literacy problems often have speech and language difficulties. These present as delayed speech and language development, persisting with articulation, word finding and grammar. Some studies have demonstrated that speech, language and literacy problems co-occur and they are more common in males (1).

On the other hand, a number of studies have also attempted to identify the predictors of literacy outcome in children with speech and language difficulties. These studies have had interesting but sometimes conflicting results. Some studies report that syntax performance is a particularly good predictor of literacy outcome (2,3), while others have emphasized aspects of speech production as being the strongest predictor (4,5). Indeed it is possible that normal speech production may compensate for other weaknesses.

Before learning to read and spell, children have already established a speech processing system to deal with their spoken language. This system is also the foundation for their written language development.

Speech processing system includes semantic representation, phonological representation, motor program, grammatical representation and orthographical representation. Children with speech difficulties have one or more problems in the speech processing system. In order to produce a word, the child needs to have the components of the word assembled into the correct sequence. This *motor program* is a set of instructions for the pronunciation of the word sent to the mouth. Assembling new motor program is particularly difficult for children (1).

Studies which given a range of speech tasks to children

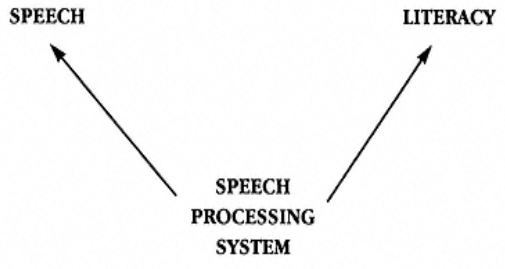

Figure 1- The relationship between speech and literacy development

with speech and literacy problems have revealed that different profiles of performance on the tasks reflect different levels of breakdown in speech processing.
Stackhouse and snowling (1992b) presented tasks of single-word naming and repetition, and non word repetition. Thus, it seems that motor-verbal skills are very important in acquiring speech and literacy; and deficiency in these skills will lead to speech and literacy problems. In this study, motor-verbal skills are assessed by naming speed and word-phrase repetition (1).
Naming a picture requires the child to access his/her own presentation of the word. The child has to identify a picture and verbally produce its name without hearing from the tester. In order to convert a visual stimulus into a spoken form, the child has to identify the picture semantically before accessing the existing motor program for that word. If it is a word that is present in his/her receptive vocabulary (i.e. one with which the child is familiar but for which s/he does not have an existing motor program) s/he may have to reflect on the phonological representation of that word in order to create the motor program for it (1). According to the models of word processing proposed by LaBerge and Samuels and by Ehri, learners could be said to attain "maximum" speed in identifying words when all of the associative links between codes in the various memory and response systems are completely integrated or unitized in the memory. Thus, enabling the learners to execute the identification process at the top speed considering their age and level of cognitive maturity (6).
Furthermore, the double deficit hypothesis assumes that children with reading disabilities may either suffer from a phonological deficit, a naming speed deficit, or from both (7). Empirical evidence comes from Wolf et al., who found that in a sample of disabled children's reading, 60% of the children were found to be impaired in both rapid naming and in phonological awareness, 15% were selectively impaired in rapid naming and 19% in phonological awareness(8).
Blachman concluded that based on the regression analyses, rapid naming of colors and rhyme production are significant predictors of reading achievement in children who attend kindergarten, whereas rapid naming of letters, rapid naming of colors, and phoneme segmentation are significant predictors of reading achievement in first graders, accounting for 53% to 68% of the variance of the reading measures used. Thus, particularly in the first-grade sample, a powerful relationship is suggested between the end-of the year reading achievement and rapid naming ability (9).
Naming speed skill is one of predictors of reading achievement and language development, and another factor is word-phrase repetition. Over the last two decades, researches have consistently shown that English-speaking children with specific language impairments (SLI) score significantly lower than their age-matched typically developing peers (TDAM) and language-matched typically developing peers (TDLM) on tests of working memory (10). Research has focused on both phonological working memory—for example, non-word repetition (11,12), and sentence repetition (13). Because NWR and SR have been described as clinical markers for SLI (14,15 16) in this study, we have focused on those aspects of working memory.
Five years old preschool children's motor-verbal skills are very important in their future speech and literacy development. Despite the increased attention paid to reading problem and speech & language deficiency, few rigorous evaluations have been undertaken and little attention has been given to the development of a norm for children. It is time to address this need so that professionals can use the results of this study. The aim of this study is to offer means, standard deviations and 95% confidence interval of motor-verbal skills. Thus, children with lower motor-verbal skills are at the risk of reading problem and dyslexia. The results of this study could be used in clinical situations, especially in speech therapy clinics to diagnose children with reading and articulation problems.

Materials and Methods

The sample included 220 six years old children from elementary schools in Semnan. It is important to note that these students had been evaluated 1 year ago. The sample size at 2006 was 400 students, who were randomly selected among 2256 5 years old Semnanian children. These 400 students spoke Persian and Semnanian, and did not have any speech, language or auditory deficits. In these studies, only 220 0f the 400 students were evaluated by Naming Speed Test and Word and Phrase Repetition Test. Consent was obtained from all the parents of the children , and data confidentiality was also ensured.

Measures

Naming Speed Test: Rapid naming of picture was administered in this study. The test compromised of 50 stimuli consisting of five different items (apple, ball, horse, watch, car) displayed in a random order over 5 horizontal row of 10-items per row. Each child was asked to name the items as rapidly as possible. A 0.1 `s stop watch was used to time each subject, beginning with the subject`s first response after the examiner said "go". Any naming errors, omission, substitution and self-corrections were noted in addition to the total time. Malekmohammadi, hasn`t reported the validity and reliability for this test(17), but, the internal consistency of this test ,based-on the result of this study, was high(alpha coronbach= 0.88).
Word and Sentence Repetition Test: This test includes three words (/zistšenasi/, /hipotalamus/ and /fisiology/), and two phrases and sentences (/quriye gol qermezi/ and /gorge qavi ye galle gavo xorde/). The words and phrases spoken by the examiner and the child were repeated 4 times. Each item had one score, thus, the maximum score of the word repetition segment was 12 and the maximum score of the phrase and sentence

repetition was 8. The sum scores of this test was 20(17). This instrument has been used as a valid and reliable test (17). Further, the internal consistency of this test based-on the result of this study was high (alpha Coronbach= 0.71).

To perform the test, the following were considered:

In the case of observing any symptoms of any disorders, the child's family should visit a specialist.

Consent was obtained from all the parents, and data confidentiality was also ensured.

The child is not obliged to respond to any parts of the test. Before the test, examiners should try to be sincere with the child.

Regardless of whether the responses are correct or not, the child should never be encouraged, blamed or punished .

The nature of this study was non-aggressive and did not impose any harm on the child physically and educationally.

Results

In this study, the age of the subjects was 6 years. In general, the children found the task interesting and all of them were able to engage in the activities. The means and standard deviations of naming speed, numbers of substitution and omission errors, word and phrase repetition are shown in Table 1. A t-test analysis of these data indicated that the number of substitution errors were significantly more that the number of omission errors (t=8.56, p<0.001). Further, the results indicated that the mean of word repetition was significantly more than phrase and sentence repetition (t=7.93, p<0.001).

Discussion

The results of paired t-test are shown in Table2. As shown in Table 1, 6-years old children's naming speed mean was 0.87(0.13), and this score has increased significantly compared to a year ago(t=10.950, df=220, p<0.001).

Moreover, the mean of the 6-years old children's numbers of word and phrase repetition were 8.41(2.92) and 6.51(1.73), respectively. And these scores have increased significantly compared to a year ago(word repetition: t= 14.231, df=220, p<0.001 and phrase repetition: t= 12.112, df= 220, p<0.001)

This study was performed to determine the means and 95% confidence intervals of normal 6 years old children's motor-verbal skills. The most common errors in “naming speed test” were “substitution” and “omission” respectively (1). However, based-on the previous studies, it seems evident that omission was the most common error but not substitution. It is important to note that subjects of the mentioned studies were 5 years old preschoolers, but in this study, the subjects were 6-year- old first-graders.

Furthermore, 5 years old children's naming speed has increased significantly after one year. Thus, it seems that naming speed has increased along with reading skills enhancement. Consistent with this perspective, a number of studies have found that some children with severe reading disorder could be differentiated according to their speed or rate for naming color, rather than their color naming accuracy (18). Pursuing this finding, Denckla and Rudel(1976a, 1976b) designed a serial continuous naming task and investigated the naming ability of average reader, dyslexic children and learning disabled children for highly visual symbols, digits, colors and common objects. Denckla and Rudel `s cross-sectional results indicated that children `s speed at naming such visual symbols was strongly related to their reading performance (19,20). Therefore, increasing naming speed after one year was not out of the prospect.

Another finding of this study was that 6 years old children's word repetition mean was significantly more than phrase repetition means, and this finding was consist with other studies(1). Although, in general, word repetition skills are significantly better than phrase and sentence repetition, it is not uncommon for

Table 1. Descriptive statistics for 6-year children(n=22)

Variables	Maximum	Minimum	Mean	Std. Deviation	95% confident interval of the difference
Speed naming	1.43	0.45	0.87	0.13	0.86-0.89
Numbers of substitution errors	4	0	0.69	0.92	0.57-0.81
Numbers of omission errors	2	0	0.11	0.41	0.05-0.16
Word repetition	12	1	8.41	2.92	8.02-8.19
Phrase repetition	8	0	6.51	1.73	6.28-6.74

Table 2. Paired t-test results on scoring relating to naming speed and repetition test(n=221)

Variable	Paied Difference					t	df	p
	means	Std. deviation	Std. error mean	95% confident interval of the difference				
				lower	upper			
Speed naming	0.137	0.186	0.012	0.112	0.161	10.950	220	0.001
Word repetition	4.018	4.197	0.282	3.461	4.574	14.231	220	0.001
Phrase repetition	2.287	2.810	0.189	1.917	2.662	12.112	220	0.001

sentence repetition to be worse than single word repetition in children with speech and literacy difficulties. Such children may not be able to repeat word sequences as a result of poor auditory memory.
Children will perform poorly on sentence repetition as a result of grammatical difficulties. This may be particularly apparent in spontaneous sentence production in conversation or in picture descriptions (1). It is important to note that no similar research to this study was conducted in Iran.
Therefore, in assessing children should consider the following consideration
If naming a word is worse than repeating it, then it can be gathered that the child has the articulatory ability to produce the word (since s/he could repeat it) and therefore articulatory skills are intact. Therefore, this event may be due to imprecise phonological representations, or an incomplete stored motor program, or it may be due to poor links between the semantic and phonological representations and/or motor program. All of these possible deficits make the word difficult to access and they result in word-finding difficulties and low speed naming. Nevertheless, where naming is better than word repetition, then input skills should be investigated since the child can name familiar words from his/her own stored representations but does not process items presented auditorily for repetition(1).
The major weaknesses of this study were uncertain validity and reliability of the test which was developed to assess the naming speed, word and phrase repetition skills, and lack of an appropriate place at schools to assess children. As a result, further research on the motor-verbal characteristics of the participants and other children will require the development of a valid measure of motor-verbal skills. Furthermore, the results of this study were based on Semnanian children, and it is not known whether similar finding could be generalized to other populations. The small sample size may have considerable impact on the overall result of this study. Considering the limited sample size, the replication of this study with larger sample size seems crucial. The high drop-out rate in this study was another important limitation. This 45% drop-out rate was due to not being able to locate/find the subjects. Semnan is a colonist city, and therefore this drop-out rate wasn`t unusual.
A question to be explored in future research is whether these variables continue to explain a significant amount of the variance of reading achievement at the end of second, third and forth grade. In addition, screening instruments used to identify children who are likely to experience reading difficulty should begin to reflect the relationship between the language processing skills and reading achievement.

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