

## The Study of the Non-verbal Motion Imitation on the Length of Utterance in 3-9 year Old Children with Autism Disorder

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### *Abstract:*

**Objective:** The purpose of this research is to study the relationship between the non-verbal motion imitation and the length of utterance in the autistic children and the effects of the length of utterance in these children.

**Material and method:** In the first stage of this study, 22 autistic and 30 healthy children participated; the study was done on the available samples. In this stage, the length of utterance of the two groups was compared. In the second stage, the random and interventional study was done, the autistic children were categorized into two experimental and control groups. Then, those in the experimental group underwent non-verbal imitation exercise one hour a day for 60 days before and after the intervention. The length of the utterance was examined by the picture description test in the two groups. Independent T-test, regression and analysis of covariance were used to analyze the data.

**Results:** A significant difference was revealed in the length of utterance in the healthy and autistic children. ( $p \leq 0/01$ ) The results showed that also there was a positive correlation between the length of the utterance and the verbal imitation ability in the autistic children under the study ( $r=0.884$ ). In addition, data showed that there was a significant difference between the length of the utterance of the two experimental and control groups after the intervention. ( $P \leq 0.01$ )

**Conclusion:** There was a strong and positive correlation between the length of the utterance and non-verbal motion imitation in autistic children. It was concluded that doing non-verbal motion imitation exercises will increase the length of utterance in these children.

**Keywords:** *Autism, imitation, length of utterance, speech*

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**Introduction:**

Language is the most important and evident feature of human beings which distinguishes human from animals. Although communication systems have been observed in animals, human language has unique properties that make it superior to the other communication systems. One of these properties is being reproductive and infinite. We can make unlimited sentences with limited number of sounds and transfer the new concepts, sentences that we have never heard from others and no one had used them. The language system and its origin had been noticed by scientists. On the other side, the neurological basis of language is one of the important subjects in the neurology science. (Kandel, et al., 2000) One of the fundamental subjects in the language and speaking, its outer appearance, is the relationship between speaking and the dynamic mechanisms of the brain and whether the regions involved in speaking are those regions in the brain which are involved in the movement of the organs. Can we understand the probable origin of the language by studying the relationship between speech and the movements and the symbols that hands make while speaking? The theory that human language was first created as non-verbal and symbolic communication and then the movements of the hands were transferred to the speaking organs during the evolution is one of the most important theories for the support of which a great deal of evidence has been proposed. (Stein, 2003) The question of what the origin of the language is and when and how human beings could achieve the lingual capabilities has been posed by many experts. According to this theory, the movements of our hands during speaking have remained from that symbolic communication system. So, clinical evidence is available which supports the importance of hand movements in improvement of speech conception by the listeners (Mcneil, 2005), but the issue arising by some research is the importance of these movements in helping the speaker to recover the words and plan the movements of the speech. (Goldin & Meadow, 2003) One of the most recent results in the neurology sciences which made great differences in our scientific recognition about the phenomena, such as communication, conception, empathy and imitation, was the discovery of the mirror neurons. It was observed that some of the neurons in the motion cortex of the chimpanzee are activated not only when the animal moves but also when the animal watches the same movements done by others. This property makes the viewer have an inner version of the external actors' action inside and understand its behavior and as a result its probable purposes and intentions by that. The mirror neurons can provide an explanation for limitation, observational learning, empathy, conception and reading minds. (Rizzolatti, 1996) According to this, the communication and developmental disorders experts have paid attention to the autism group disorders more and the theory that the mirror neurons disorder can be the reason of the occurrence of problems in imitation of the autistic people. Also, the researchers working on development of language have found the evolution of the mirror neurons as a proper region for explanation of the creativity in human being. (Allot, 2001) This assumption that the development of the imitation ability in the primates and primary humans is the origin of language was reinforced and the importance of the imitation became more prominent. The

imitation ability can predict the future social development level in autistic children. (Dodd, 2005); a positive connection has been seen between the cognitive abilities and imitation abilities and also imitation and language development abilities. (Vivanti et al, 2008) It seems that imitation has various cognitive and social functions and it is a powerful tool for learning, so imitation defects may cause developmental disorder in various cognitive and social aspects with severe effects on the individual's performance and his/her life quality.

In this study, we aimed to determine the non-verbal imitation effect on speaking skills development. Although some research has shown a correlation between the non-verbal imitation and speaking skills, the nature of this relationship isn't so clear and we don't have much information about the possibility of using the non-verbal imitation exercises in the autistic children's speaking skills improvement.(Dodd, 2005) Although there are reports which suggest that teaching symbolic language to autistic children without speaking can improve their speaking skills (Gafen, 2006), it is not clear whether the reason of this development is the increase in these children's ability of communication with others or doing the targeted movements with hands that had led to improvement in speaking skills. In this study, the imitation skills which are out of the communicative context are provided for the triables so that the possible effects of the communication skills development will be neutralized. On the other hand, if the speaking schematization in the syntactic dimension can be one of the dynamics schematization cases, it seems that we can help to improve the syntactic skills of autistic children by increasing the motion imitation skills and combination of some motion actions imitation. The most important and common syntactic development index usually used in various studies is the mean length of the utterance (MLU). In this research, we studied the effects of non-verbal imitation exercises on the increase of the MLU of autistic children.

### **Research Question:**

Can we improve speaking skills in autistic children by activating the motion regions involved in the imitation process and specially by providing the hand movements exercises?

### **Research Hypothesis:**

We cannot improve speaking skills in autistic children by activating the motion regions involved in the imitation process and specially by providing the hand movements exercises.

### **Method:**

#### *Participants*

This research is a clinical trial which was done as experimental and correlational. In the first stage, there was no intervention and just the length of the utterance was compared in two intact and autistic groups. In this stage, the correlation between the non-verbal motion imitation test

and the length of the utterance in autistic children was studied. In the second stage, an interventional research was done. The autistic group was categorized into two random groups and intervention was done on the experimental group. As most of the 3-9 year old autistic children did not have the qualification to enter the study (because complete recognition of the pictures of the test requires considerable attention, concentration and speech perception), the research was done on the available samples who had the inclusion criteria during a year and totally 22 were recognized without the entrance qualification. This group of children were compared with a group of 30 members of intact children (as speech therapists and physiotherapists recognized) selected from the children of a kindergarten and an elementary school in Shiraz; they were in the same age gap.

### *Procedure*

In the test session, the child was seated on the child seat behind a desk and the tester sat in front of him so that the eye contact was easily possible. In each case, if the child was impatient or wanted to go out, first the tester tried to calm him down by using entertaining games or providing nutritional encouragements and helped him to be interested in the session's environment. In the picture description test, 40 common pictures in the education and therapeutic centers were used. Each of these pictures told a short story or an event; they asked the children to describe the things they see. Anything that the child said while describing the pictures were recorded with the voice recorder and implemented by the tester by phonological method. Then, the number of child's statements was evaluated and whole morphemes of the child's speech sample were evaluated and divided by his total statements. Then, the MLU was evaluated. For teaching the method of doing the test, first three cards were used and the template was given to the child so that he could explain the picture with continuous sentences. The motion imitation test was modeled on Rogers and colleagues' imitation package. (Rogers et al., 2003) In this package, 19 tasks which included 7 hand movements imitation, 7 Imitation of the actions on stuff and 5 oral-facial imitation were used. They totally wanted the child to imitate 10 different movements and in order to do this they asked him to repeat what the tester was doing. For better realization, first two simple imitation tasks were given to him from the package and if he didn't imitate them, the tester moved the child's organs which indicated the imitation and then encouraged him to repeat it. In order to check the stability of the tests before the research began, these tests were done on 40 intact children that did not participate in the research with one week interval and the correlation factor of the triable's scores was evaluated in both tests. This correlation was 0.93 for the picture description test and 0.79 for the motion imitation test.

### **Results:**

This research was done on 22 autistic children with a mean age of 61.6 months (5.13 years). They consisted of 16 boys, 6 girls, and 30 intact children with the average age of 6.8 months

(5.06 years) including 23 boys and 7 girls. Table 1 shows the results of the picture description test; as it is shown, the MLU of the intact children (3.56) is more than autistic children (1.83).

Table 1: The results of the picture description test

Standard error of mean	SD	M	N	subjects
0.102	0.599	3.56	30	normal
0.206	0.969	1.83	22	autistic

Table 2 shows that the observed “t” value (7.52) in the 0.01 level was significant. In other words, there was a significant difference between the intact and autistic children in the MLU. As the mean of the two groups shows, the MLU of the autistic children was less than their intact counterparts.

Table 2: The results of t-test (comparison of the MLU of the autistic and intact children).

t	D	df	a	Standard error of difference
7.52	1.73	31.1	0.000	0.23

On the other hand, our findings showed that there was a positive and significant difference between the non-verbal motion imitation ability and the MLU of the autistic children. Results showed that the observed “r”(r=0.884) in the 0.01  $\alpha$  level was significant. (Table 3)

Table 3: The relationship between the motion imitation correlation and the MLU in the autistic children

r	R <sup>2</sup>	Standard error of estimate	a
0.884	0.782	0.464	0.000

The results of the second research in which the intervention was done revealed that only in a group of autistic children the MLU of the experimental group did not show many changes and it exceeded the control group. (Table 4). As can be seen in Table 5, the amount of observed “f” (f=32.55) was significant in the 0.01 level; in other words, the motion imitation exercises resulted in an increase in the MLU in the autistic children ( $p \leq 0/01$ ).

Table 4: Mean and standard deviation of the MLU in the experimental and control groups

subjects	M	SD	MLU
experimental	1.833	0.979	Per- taste

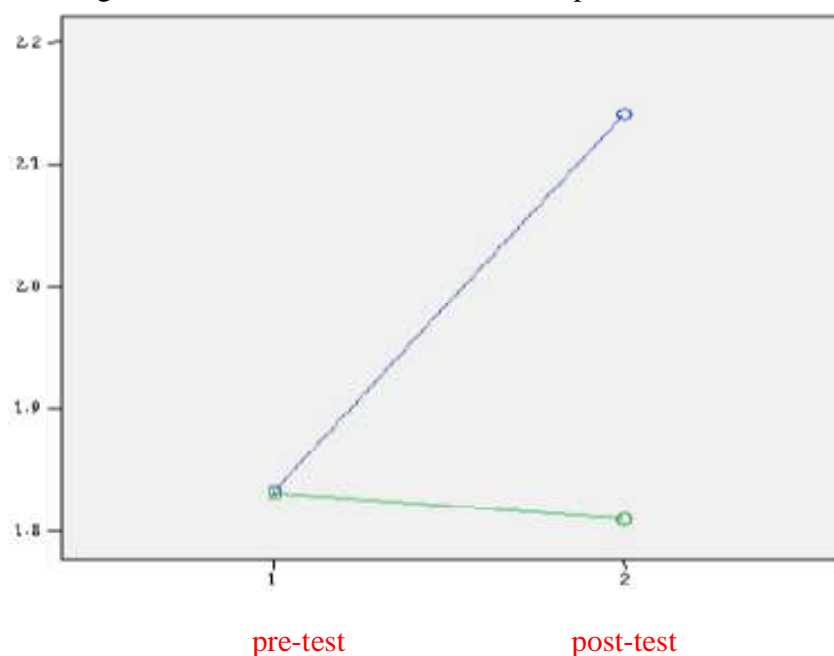
control	1.830	1.010	Pos -taste
experimental	2.142	1.037	
control	1.81	0.981	

Table 5: The effects of the intergroup factors

supply	ss	df	MS	F	a	eta
length of utterance	7.170	1	7.170	.116	0.000	.983
groups	20.155	1	20.155	884		0.632
error	0.558	19	0.558	32.557	0/000	
sum	0.343	21	1.02			

The diagram below is related to the MLU of the autistic children before and after the intervention. As can be seen, there are no differences between the means in the experimental and control groups and their diagrams are completely matched (mean=1.83) but a significant difference was observed in the MLU of the pre-test and post-test after the intervention. The MLU was 1.81 in the control group and 2.14 in the experimental group.

The diagram of the MLU alternation in the experimental and control groups' length of utterance



### Discussion and conclusion:

The results of this research are in the same line with the research in the other languages and all of them show that there is a difference in the MLU of the autistic and intact children. (Dodd, 2005)

Moreover, a positive and significant correlation was seen between the motion imitation ability and the MLU in the autistic children. This can be expressed in support of the motion theory of the language. (Allot, 2001) The results of the present research also showed that non-verbal motion imitation which was presented as an exercise during the intervention period led to a rise in the MLU of the autistic children. We can attribute these differences to the research intervention according to the statistical tests since there were no differences between the mean scores in the experimental and control groups but there were significant differences between the two groups. On the other hand, as the intervention period was more than 2 months, the developmental changes which were the result of the rise in the abilities during the time didn't have much effect on the results of the research. Repeated research showed that using the cues during speaking caused the vocabulary retrieval and increase in the speech enrichment (Krauss et al., 1996), so it was predicted that the improvement of the autistic children in using the motion cues can increase the MLU. The MLU supports the motion theory of the syntax. According to this theory, the general motion sequence ability shows itself as the MLU increases. It should be mentioned that in this research the length of utterance was evaluated by the MLU index and according to the morpheme. The researcher's observations showed that if we had evaluated the length of utterance by, the number of the words used, there wouldn't have been much difference. In other words the autistic children of the experimental group did not use more words in their sentences in the post-test but they used more complicated verbs with more morphemes.

#### **Limitation and suggestion:**

One of the most important limitations of this research was the number of the tribal's. If we aimed to generalize the results we should do the research with more tribals. It is recommended that in addition to the length of utterance the effects of the motion imitation on other aspects of the language like the ability of phonology, syntax and usage cognition should be checked. Also, as to the therapeutic aspect, according to the results of other studies which indicate that doing the motion imitation exercises can increase the length of utterance in the autistic children, we suggest that the non-verbal motion imitation exercises and generalization of the symbolizing ability of the autistic children should be considered in the therapeutic and rehabilitation programs. Instead of working directly on the increase of the length of utterance of the autistic children, we can raise the symbolic and motion imitation skills. Thus, children can use some other methods instead of speaking to communicate and they can resolve their requirements. This in turn can raise their speaking skills at the same time. On the other hand, the results emphasize the importance of occupational therapy on the speaking skills improvement in autistic children. If autistic children have motion exercises and occupational therapy, at the same time their speaking skills will further improve. In this study, we confirmed the importance of team work in rehabilitation of the autistic children again.

**Acknowledgement:**

We are grateful for the support from the Research Grants Council of the Shiraz autism Center Special Administrative Region for support of this research.

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