



Original Article

Phonological Awareness in Non-fluent Preschool Children

 Mohammad Ghorbani¹, MSc; Maryam Vahab^{2*}, MSc; Jamal Ahmadi², BSc
¹Speech Therapy Department, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran²Speech Therapy Department, School of rehabilitation sciences, Shiraz University of Medical Sciences, Shiraz, Iran

ARTICLE INFO

Article History:

Received: 28/05/2019

Revised: 20/08/2019

Accepted: 28/08/2019

Keywords:

Phonological impairments

Stuttering

Childhood

Please cite this article as:

Ghorbani M, Vahab M, Ahmadi J.

Phonological Awareness in Non-

fluent Preschool Children. JRSR.

2020;7(1):31-35.

ABSTRACT

Background: The relation between disfluency and aspects of language, including phonology, has been investigated for many years. Whereas past literature reported that the incidence of phonological difficulties is higher in children who stutter when compared to normally fluent children, the suggestion of association between the two disorders also drew several critical evaluation. This study investigated the phonological awareness abilities of four- and five- year old non-fluent preschool children.

Methods: This cross-sectional comparative study was done on 50 children. 25 non-fluent preschool children (21 boys and 4 girls) were paired according to age, sex and socioeconomic status to their typically fluent peers. Participants completed multiple measures of phonological awareness abilities, as well as measures of expressive and receptive vocabulary and articulation.

Results: Regarding the scores of the phonological awareness test there were significant differences between non-fluent children and their typically fluent peers. The four year old children who were non-fluent performed significantly less well than their typically fluent peers on tasks of syllable awareness, intra syllable awareness and phoneme syllable awareness. The five year old non-fluent preschool children performed significantly less well than their typically fluent peers on tasks of intra syllable awareness and phoneme syllable awareness.

Conclusion: Results suggest that non-fluent preschool children have phonological differences in aspects of phonological awareness that may contribute to an unstable language planning system in preschool children who stutter.

2020© The Authors. Published by JRSR. All rights reserved.

Introduction

According to some theories, the difficulty in selecting and preparing sounds that constitute the words in the speaker's message is one of the factors that lead to non-fluency [1-3]. Although psycho-linguistic theories, which are related to stuttering, are different from each other in detail, they all assume that delays or failures occur during the phonological encoding process, a process in which words are phonologically made up of single phonemes [1-3]. The theoretical structure of phonological encoding

has been explained in different models of language formation. Some of these models, such as the "Gestural Linguistic Model" [4, 5], believe that the process of phonological encoding has a close relation with motor speech production. Other models, such as Word Encoding by activation and verification (WEAVER++) [6-8], believe that phonological encoding is a process that is activated before speech motor systems. Both models evaluate the process of phonological encoding, but each of them has a different view about how this process works. WEAVER++ considers phonological encoding as the process by which any phonological code of the word (i.e. the constitutive phoneme or syllable of that word) is rebuilt to provide the phonological structure of words efficiently.

*Corresponding author: Maryam Vahab, Speech Therapy Department, School of rehabilitation sciences, Shiraz University of Medical Sciences, Shiraz, Iran. Tel: +98 917 309 0144; Email: Vahabm@sums.ac.ir

Phonological encoding must be evaluated through alternative processes which are a reflection of its nature because it has been deeply embedded in the lingual formulation process and therefore it cannot be directly observed and evaluated [9, 10]. Phonological awareness is one of the aspects of phonological encoding that can be observed and evaluated, which means one's ability to identify, isolate, integrate, and manipulate different constitutive parts of speech, such as word, syllable, and phoneme. Phonological awareness skill is easily understood and preschoolers and primary school children can use it when doing their homework [11, 12]. This skill progresses with child growth from simple to complex levels. Identifying rhymes, sound matching, syllable blending are abilities which are formed at the beginning of the spectrum of phonological awareness and skills such as syllable and phoneme segmentation, elimination of syllable and phoneme; and phoneme reversal [11, 13, 14]. Children aged 4-6 years can easily do assignments which are related to identifying rhymes, sound matching and phoneme blending, and assignments which are related to phoneme segmentation and phoneme reversal will stabilize at older ages [11].

The coincidence of stuttering in preschoolers with a period when lingual development and phonological skills are rapidly developing [15] has led researchers to investigate the relation between stuttering and phonological skills more closely. Many of these studies focused on the relation between stuttering and delay or problem in phonological development and claimed that phonological disorders are common among people who stutter [16-19].

Different results have been reported in the literature on the relation between non-fluency and phonological skills.

Pelczarski and Yaruss in 2014 investigated phonological encoding abilities in 10 non-fluent children aged 5-6 years with non-stuttering counterparts. The assignments related to phonological awareness (sound matching, phoneme blending, phoneme eliminating) were evaluated in the subjects. The results showed that non-fluent children have poorer performance in the skills of phoneme blending and phoneme eliminating compared to their normal counterparts [20].

Sasisekaran and Byrd in 2013 compared the phonological encoding skill of 9 primary school children who stuttered (7-13 years) with their non-stuttering counterparts. The assignments under study included rhyming and phoneme identification in a one-word sentence. There were no significant differences between groups' performance in phonological awareness assignments, but the researchers reported that non-fluent children needed more time to identify phonemes [21]. Paying more attention to the complexity of the assignments and the number of participants in this study could provide a better understanding of the role of phonological awareness in the occurrence of non-fluency and the development of stuttering.

Pelczarski and Yaruss in 2016 investigated the phonological memory in 5-6 year-old children. They

matched 11 non-fluent children with their fluent counterparts. Participants were asked to cooperate in doing the non-word repetition test. The non-word assignments included words with 1 to 7 syllables. The non-fluent children showed poorer performance in doing non-word assignments. The fluent children showed a stronger correlation between lingual skills and phonological memory compared to their non-fluent counterparts [22]. The low sample size is one of the limitations that should be taken into consideration in this study.

Bajaj et al. in 2004 investigated phonological awareness skills in 46 children who stuttered and their non-stuttering counterparts. The age range of participants was 5 years and 10 months to 8 years and 10 months. The assignments of phonological awareness skills in this study included identifying and manipulating phonemes and reversing them. The results showed that there was no significant difference between phonological abilities of non-fluent and fluent children [23]. The assignments of phonological skills that the author of this study had chosen were not developmentally appropriate for all participants. For instance, phonemes reversal, which is used for 7-year-old children and older, is a complex assignment.

Ghaffari et al., studied the phonological awareness skills in a cross-sectional comparative study on 53 children with and without non-fluency with an age range of between 4-8 years. The phonological awareness skills under study included syllable awareness, intra syllable awareness, and phonological awareness. There was a significant difference between the scores in the phonological awareness test between the groups who stuttered and the non-stutterers. However, there was no significant difference between the phonological awareness score and the stuttering severity of children who stutter [24].

The contradiction between the results of the conducted studies, limited studies in the Persian language (only one study), the small sample size of most of these studies, and the incompatibility of some assignments of phonological awareness with the age of the subjects in some studies, creates the necessity of repeating the comparative studies in this area between non-fluent subjects and their normal counterparts.

Since exploring the relation of cause and effect between non-fluency and phonological awareness, has become more apparent due to the studies comparing the two groups of non-fluent people and their normal counterparts, this study was carried out to compare the phonological awareness of 4 and 5-year-old non-fluent children with their normal counterparts. The results of this type of study suggest the possibility of a relation between phonological awareness and non-fluency and may affect the design of studies related to exploring the cause and effect relation.

Methods

This cross-sectional comparative study was done on 50 children (25 non-fluent children and 25 children without

non-fluency) with an age range 4 to 5 years and 11 months in Shiraz. The non-fluent children (23 boys and 4 girls) were randomly selected from state and private speech therapy clinics, psychology and consultation clinics, and the clinic of rehabilitation of Shiraz University of Medical Sciences. Also, 25 children without non-fluency who were given activities in non-fluency subjects in terms of age, gender and socioeconomic status and were randomly selected from kindergartens in Shiraz in accordance with the inclusion criteria. This study was approved by the ethical committee of Shiraz University of Medical Sciences. Informed consent was obtained from parents of patients participating in the study. At first, the percentage scale of Stuttered Syllable (SS) was used for definitive diagnosis of subjects' non-fluency.

The percentage of non-fluent syllables or words is the non-fluency frequency, a valid measurement method, which is used to evaluate non-fluency [25]. To evaluate non-fluency based on the frequency of non-fluency, a sample of the child's speech is first taken and then the percentage of non-fluency is calculated either on the basis of the non-fluent words number or non-fluent syllables number. If the percentage of the child's non-fluency is more than 10%, the child would be considered as non-fluent. In the literature, the percentage of non-fluency is often obtained based on the number of non-fluent syllables because it is more accurate and it is possible a non-fluent person indicates non-fluency on more than one syllable in multi-syllable words [26-28]. Before doing the test, a continuous speech sample, which contains at least 200 syllables, was taken from the children who were candidates for non-fluency and the children's voices were recorded with a voice recorder. The children whose SS score was more than 10% were entered in the study. In order to ensure the fluency of fluent subjects (having less than 1% non-fluency), the primary speech evaluation was employed by the researchers and only the subjects with less than 1% non-fluency were selected, if they had non-fluency at all. Interviews and forms related to medical and family history in speech therapy clinics of faculty of rehabilitation, which had been provided by faculty members, were used to ensure the lack of neurological, cognitive, motor, and bilingual problems.

In the next step, language skills and speech production of both groups were evaluated. The researchers evaluated subjects' speech production using a words pronunciation test (phonetic). The phonetic test is used to evaluate the correct speech production of sounds in the word. In this test, each phoneme was evaluated in the first, middle and last position of the word. The test of language development (TOLD) was conducted to determine the normal development of language in the subjects. The TOLD test is a valid tool to investigate the normal development of language and its various components in children. This test consists of nine sub-tests (six main sub-tests and three supplementary sub-tests). The main sub-tests include: picture vocabulary, relational vocabulary, oral vocabulary, grammatical understanding, sentence imitation and grammatical

completion, and supplementary sub-tests include: word discrimination, phonemic analysis, and word articulation. In the study only 6 main sub-tests were used. The raw sub-tests scores of TOLD test were analyzed based on the instructions and tables of the test and standard scores of the sub-tests and the linguistic age of the subjects in each sub-test was calculated. Therefore, our inclusion criteria included: being aged between 4 to 5 years and 11 months, no neurological, cognitive and motor problems, no bilingualism, no speech production problems, no language problems and having normal development of language, having more than 10% non-fluency syllables ($SS > 10\%$) for non-fluent subjects and having a criterion of less than 1% of non-fluency syllables ($SS < 1\%$) for normal subjects which were evaluated by the methods described above.

Soleimani-Dastjerdi's phonological awareness test [29] was taken from the subjects who met the inclusion criteria. This test has been designed, validated and has reliability to determine phonological awareness in groups aged 4 to 7 years by Soleimani and Dastjerdi Kazemi. The test consists of three parts: syllable awareness, intra syllabic awareness, and phoneme awareness. The test has 10 sub-tests and 4 final sub-tests (sub-tests 7, 8, 9 and 10) were not used because they had been designed for 6-year-old children and older. The assignments which have been used in the present study include syllable segmentation (syllable awareness), alliteration and rhyme (intra syllable awareness), and phoneme blending, identifying words with the same beginning phoneme, identifying words with the same final phoneme (phoneme awareness). Each of these sub-tests was done in accordance with the points and instructions mentioned in the test and according to the age of the child. At the beginning of the test, after communicating with the subject, they were given the necessary explanations and two or three guiding words were given as examples in each sub-test. First, the instructions of each part were explained for each subject with guide words. Then images of each part were provided to the subject. If the subject responded correctly to the requested item, they were given score one, and if they did not respond correctly they were given score zero. During the test, the tester behaved in a way that the subject could not realize whether their answer was true or false and whether zero or one was recorded in the table.

Data was analyzed by SPSS software version 21, and non-parametric U Mann-Whitney test was used to compare the two groups. The reason for using the non-parametric U Mann-Whitney test was the lack of normal distribution of the data.

Results

50 fluent and non-fluent children were employed in this study. The non-fluent group included 14 children 4-4.11 years old (11 boys and 3 girls) and 11 children 5-11.5 years old (10 boys and 1 girl). The fluent group was matched with the non-fluent group in terms of age and gender. Kolmogorov-Smirnov test was used to evaluate

Table 1: Shows the mean total score and sub-tests of phonological awareness in the non-fluent and fluent children with the age range 4 to 4.11 years

	Number	Mean (standard deviation) syllable awareness	Mean (standard deviation) Intra syllable awareness	Mean (standard deviation) Phonological awareness	Mean (standard deviation) total score of phonological awareness
Non-fluent groups	14	35/8(86/1)	39/5(30/1)	42/4(82/1)	05/6(02/1)
Fluent groups	14	57/7(55/1)	67/4(69/0)	07/4(43/1)	44/5(68/0)

Table 2: Shows mean total score and sub-tests of phonological awareness in the non-fluent and fluent children with the age range 5 to 5.11 years

	Number	Mean (standard deviation) intra syllable awareness	Mean (standard deviation) Phonological awareness	Mean (standard deviation) total score of phonological awareness
Fluent	11	27/9 (29/1)	63/8 (23/1)	95/8(23/1)
Non-fluent	11	67/4 (76/0)	07/4 (68/0)	37/4(67/0)

the normal distribution of data for both groups. According to the p-value which was 0.155 and 0.152, respectively, for the fluent and non-fluent group, it was found that the distribution of data was not normal therefore; non-parametric U Mann–Whitney test was used.

Table 1 shows the mean total score and sub-tests of phonological awareness in non-fluent and fluent children with an age range from 4 to 4.11 years. There was a significant difference between the mean scores in the sub-tests and the overall score of phonological awareness between these two groups. ($P > 0.001$)

Table 2 shows the total score and sub-tests of phonological awareness of the non-fluent and fluent children with the age range 5 to 5.11 years. There was a significant difference between the mean scores in the sub-tests and the total score of phonological awareness between these two groups of fluent and non-fluent children. ($P > 0.001$)

Discussion

This study investigated phonological awareness skills in non-fluent children. Numerous studies have identified weakness in phonological awareness abilities as one of the causes of the onset of non-fluency [1-3]. However, there have also been studies which have shown that the phonological awareness skills in non-fluent children have no significant differences with their counterparts [21-23]. The present study investigated the relationship between stuttering and phonological awareness based on psycho-linguistic theories [1-8]. In order to do this we used phonological awareness tests to evaluate subjects' phonological awareness abilities.

According to the results, the mean scores of phonological awareness of non-fluent 4-year-old children with their normal counterparts indicate a significant difference between the phonological awareness of these two groups. In other words, that the phonological awareness of the non-fluent children is significantly lower than their normal counterparts. The results of the sub-tests also showed a significant difference between these two groups, in that, the non-fluent children were poorer in all three syllable and intra-syllable and phonological skills than their normal counterparts. The significant difference between the mean scores of phonological awareness of the non-fluent 5-year-old children with their normal counterparts indicates lower phonological awareness of

these children compared to their normal counterparts. The results also indicate that this group was also poorer in all sub-tests than their normal counterparts. Sasisekaran and Byrd researched about the phoneme and rhyme monitoring abilities in non-fluent primary school children. They did not report any significant difference between the two groups, but observed a significant difference when they analyzed the data about younger participants (pre-school ages). They reported that older non-fluent children performed more fully in this study, perhaps because, their assignments were not sufficiently complex [21].

The researchers in the present study came to the conclusion that the lack of significant differences in the primary school children is because of starting elementary school and reading and writing learning increases children's phonological awareness and resolves the possible weakness of non-fluent children. Therefore, the results of the present study are similar to the results of the research conducted by Sasisekaran and Byrd. In this regard, Vali et al's studies showed a strong relation between phoneme awareness, analyzing the structure of language sound, and the ability phonological decoding in gradual processing (identifying each of the word sounds from the first phoneme to the last phoneme in a word). If there is a relation between the parts of vocabulary structure and the ability to syllabify sounds of the word, then the development of phonological awareness in the child should facilitate its gradual processing. Although this may not be a typical developmental process, children with vocabulary structure problems can benefit from phonological awareness strategies. In addition, available theoretical discussions related to the findings indicate that the use of gradual encoding supports the maintenance of fluency beyond production of the word [30]. Therefore, these findings also confirm the relation between fluency and phonological awareness, which is in line with the results of the present study. The results of Pelczarski and Yaruss's study showed that the score of non-fluent children was significantly lower than fluent children in two or three phonological awareness assignments. However, the non-fluent children had poorer performance than their counterparts in all phonological measures [20], so this study is consistent with the results of the present study.

Another result of this study are the scores of 4-year-old children in relation to the sub-tests 1, 2, 3 and 4 and

the scores of 5-year-old children in relation to the sub-tests 2, 3, 4, 5 and 6, in the general scale because the total score of the group of 4-year-old children came from simpler sub-tests, while the score of 5-year-old children was from the more difficult sub-tests, therefore it can be argued that this test has less sensitivity at lower levels and will become more sensitive at older ages due to the sub-tests getting harder, so the 4-year-old children received higher scores, in other words, the non-fluent 5-year-old children do not actually have a clear phonological growth like normal children.

According to the results of Ghaffari et al.'s study, the difference between the mean scores of phonological awareness in non-fluent children with mild, moderate, and severe non-fluency was not statistically significant, unexpectedly and there was no relation between stuttering severity and phonological awareness score. According to this study, the phonological awareness test score showed a significant difference between the stuttering and non-stuttering groups, which is consistent with the results of present study based on this finding [24].

Conclusion

It can be concluded from the findings of the current study that non-fluent children, probably, have less phonological awareness skills than their normal counterparts. Therefore, the results reinforce the possibility that weakness in phonological awareness is one of the causes of non-fluency. It is recommended that more attention be paid in evaluating and treating children who stutter by concentrating on lingual skills, such as phonological awareness.

Conflict of Interest: None declared.

References

- Howell P, Au-Yeung J. The EXPLAN theory of fluency control and the diagnosis of stuttering *J Speech Lang Hear Res.* 2002; 15(3):75-94.
- Postma A., Kolk H. The covert repair hypothesis: Prearticulatory repair processes in normal and stuttered dysfluencies. *J Speech Lang Hear Res.* 1993;36(3):472-87
- Perkins W. H, Kent R. D, Curlee R. A theory of neuropsycholinguistic function in stuttering. *J Speech Lang Hear Res.* 1991; 34(4):734-52.
- Browman C. P, Goldstein L. M. The gestural phonology model. *Front Psychol.* 1997;9(2): 57-71.
- Saltzman E. L., Munhall K. A dynamical approach to gestural patterning in speech production. *Eco Psychol* 1989; 1(4):333-82.
- Willem J. M. Levelt. *Speaking: From intention to articulation.* The American J Psych. 1990; 103(3):409-18.
- Levelt W. J. M, Roelofs A, Meyer A. S. A theory of lexical access in speech production. *Behav Brain Sci.* 1999; 22(1): 38-75.
- Roelofs A. Seriality of phonological encoding in naming objects and reading their names. *Mem Cognit.* 2004; 32(2):212-22.
- Meyer A. S. Investigation of phonological encoding through speech error analyses: Achievements, limitations, and alternatives. *Mem Cognit.* 1992; 42(1-3):181-211.
- Coles M. G. H., Smid H. G. O. M., Scheffers M. K., Otten L. J. (1995). Mental chronometry and the study of human information processing. *Mem Cognit.* 1995; 20:86-131
- Gillon G. T. Phonological awareness: From research to practice. *Int J Telerehabil.* 2004; 3(4):14-23.
- Sodoro J, Allinder R, Rankin-Erickson J. Assessment of phonological awareness: Review of methods and tools. *Edu Psych R* 2002;14(3):223-60.
- Adams M. J. *Beginning to read: Thinking and learning about print.* Cambridge. Washington DC: Beranek publisher; 1990. pp. 160-72
- Schuele C, Bourdreau D. Phonological awareness intervention: Beyond the basics. *Lang Speech Hear Serv Sch.* 2008; 39(1):3-20.
- Paden E. P, Yairi E, Ambrose N. G. Early childhood stuttering. II. Initial status of phonological abilities. *J Speech Lang Hear Res.* 1999; 42(5):1113-24.
- Yairi, N. G. Ambrose. Early childhood stuttering: For clinicians by clinicians. *Can Fam Phy* 2004;50(6):479-84.
- Wolk L, Edwards M. L, Conture E. Coexistence of stuttering and disordered phonology in young children. *J Speech Lang Hear Res.* 1993; 36(5):906-17.
- Louko L, Edwards C, Conture E. Phonological characteristics of young stutterers and their normally fluent peers: Preliminary observations. *J Fluency Disord.* 1990;15(4):191-210.
- St. Louis K. O, Hinzman A. A descriptive study of speech, language, and hearing characteristics of school-age stutterers. *J Fluency Disord.* 1988;13(5):331-55.
- KM Pelczarski, JS Yaruss. Phonological encoding of young children who stutter. *J Fluency Disord.* 2014;39:12-24
- Sasisekaran J, Byrd C. T. A preliminary investigation of segmentation and rhyme abilities of children who stutter. *J Fluency Disord.* 2013;38 (2):222-34.
- Pelczarski K. M., J. S. Yaruss. Phonological memory in young children who stutter. *J Commun Disord.* 2016;62:54-66.
- Bajaj A., Hodson B., Schommer-Aikins M. Performance on phonological and grammatical awareness metalinguistic tasks by children who stutter and their fluent peers. *J Fluency Disord.* 2004;29(1):63-77
- Ghaffari SZ, Shahbodaqi MR, Jalaie. Evaluation of phonological awareness in stutterer and non-stutterer children of aged 4 to 8 years in Tehran. 2012;21(2):35-41.
- Andrews G., Ingham R. Stuttering: Considerations in the evaluation of treatment. *Br J Disord Commun.* 1971;6(2):129-38.
- Bloodstein., Ratner N. B. *A handbook on stuttering.* 6th ed. Clifton Park, NY: Publisher: Cengage Learning; 2008. pp. 119-223.
- Yairi E., Ambrose NG, Paden EP, Throneburg RN. Predictive factors of persistence and recovery: pathways of childhood stuttering. *J Commun Disord* 1996;29(1):51-77.
- Richard F. Curlee, Gerald M. Siegel. *Nature and treatment of stuttering: New direction.* 2nd ed. Boston: Pearson Publisher; 1996. pp. 24-48.
- Soleimani Z., Dastjerdi Kazemi M. Study of validity and reliability of phonological awareness test. *J Psychol.* 2005;33:82-100
- Walley A. C., Metsala J. L., Garlock V. M. Spoken vocabulary growth: Its role in the development of phoneme awareness and reading ability. *Read Wr Interd J.* 2003;16(1-2):5-20.