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Single word test for the assessment of speech sound production in Persian speaking children: Development, validity and reliability☆

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ABSTRACT

Objectives: Single word tests are used frequently to determine clients' speech sound errors. These tools are user-friendly and popular for speech and language pathologists. The aim of this study was to design and validate a single word test for the assessment of speech sound production for Persian speaking children.

Methods: The present study included two phases. In phase I, test material was developed. Psychometric properties were evaluated in phase II. In the next phase, 525 typically developing Persian-speaking children with the age range of 3–5 years old were studied. Statistical Package for the Social Sciences, version 24.0 (SPSS, Inc., Chicago, IL) was used for statistical analysis of this study. The significance level was set at ($p < 0.05$). Pilot study was performed by administrating the test on 25 typically developing children, construct validity: by administrating the test on 400 typically developing children and the comparison of performance of the children in 4 age groups (discriminative validity regarding age and by administration of this test and phonetic subtest of Persian version of diagnostic evaluation of articulation and phonology on 100 children (convergent validity)). Inter-rater reliability was performed by transcription and scoring of samples of 25 children and calculation of Intra Correlation Coefficient (ICC) was calculated. Test-retest was completed by administrating the test two times on 30 children with two weeks intervals. Internal consistency was achieved by the calculation of the correlation of the items of test.

Results: The final version of the test includes 70 target words for assessment of the consonants in three positions, vowels in medial position and consonant clusters (CVCC). There was 80% or more than it for the percentage agreement between experts for the content validity. There wasn't any significant difference between experts' responses about items of the test. 4 pictures were revised based on children's responses for the pilot study. All of the reliability values (test-re test, internal consistency and inter-rater reliability) were higher than 0.85. There was a significant difference between the four age groups for the mean value of Persian single word test for speech sound production ($p < 0.0001$). There was a high correlation between the score of this instrument and the scores of participants in the Phonetic sub-test of the Persian version of Diagnostic evaluation of articulation and phonology($r = 0.934$, $p < 0.0001$).

Conclusion: It seems that the Persian Speech sound Production Test is a reliable and valid tool that can be used to measure speech sound errors for Persian speaking children.

1. Introduction

Speech Sound Disorders (SSD) is a developmental communication disorder [1–3] and is defined as the difficulty in producing one or more speech sounds that continues beyond a certain age [2–4]. The accuracy of speech sound production is less than normally developing children with no obvious cause like sensory, cognitive or neuro-motor conditions [2]. The age of most of the clients with SSD is under 8; however,

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occasionally this disorder persists to adulthood as well [3].

It is estimated that the prevalence of SSD is 10–15% in preschool children and 4% for 6 years old children [3]. These rates show that 3–6 years old children are the major caseload of clients for speech and language pathology services [1,5–7]. For instance, Mullen and Schooling (2010) reported that up to 56% of the clients in speech and language pathology services in schools were children with SSD [8].

There are some studies that indicate children with SSD are at increased risk for development of literacy and academic problems in the future [9–11]. So, there is always a need for comprehensive assessment of this population to design the best intervention protocol. Treatment and assessment of SSD have always been the specified role of SLPs, and several attempts have been made to design and validate the assessment tools for assessing this population all over the world [12].

Samples of speech sounds may be obtained from connected, conversational and single words. Single word speech sound tests in which children should name a series of pictures to elicit speech sounds in different word positions are commonly used for clinical setting and research purposes [1,7,13]. For a child whose speech is highly unintelligible, single word instrument for speech sound production gives more useful information than a subjective assessment of intelligibility for intervention planning [14]. Fluharty(2001) emphasized that using speech sound production tests are valid and reliable and culturally appropriate for the assessment of SSD [15].

There are several instruments for the assessment of speech sound production for English [12,16,17] and other languages [12,18]. Psychometric properties of some instruments were reported in journal papers. Abou-Elsaad et al. (2009) developed an Arabic articulation test. They reported the validity and reliability of their test. There was a good value for test-retest reliability. They stated that the ability of speech sound production developed with age and there wasn't any significant difference between boys and girls [14]. Lousada et al. (2012) reported the validity, reliability and standardization of a phonetic-phonological test for European-Portuguese children with the age range of 3–7 years old. They also showed that older children had better skills in speech sound production than younger children and articulation skills of girls were better than boys [7]. So and Leung (2004) demonstrated that their test could discriminate between normal children and children with SSD [19]. Tresoldi et al. (2015) reported the validity, reliability and standardization of a quick repetition test for the assessment of speech sound production. They reported construct validity for their instrument [1]. There are two speech sound production tests for Persian speaking children in Iran. Ghasisin (2013) et al. reported the validity of the Phonetic Information Test on 150 children with the age range of 5–6 years old in Isfahan. This test includes 66 words for the assessment of consonants in the initial, medial and final positions and doesn't address consonant clusters [20]. They reported the content validity and internal consistency for their test and other psychometric properties were not evaluated in their study. There isn't any explanation about the scoring of this instrument [20]. Zarifian et al. [21] reported the validation of the phonetic subtest of the Persian version of the diagnostic evaluation of articulation and phonology (DEAP). The phonetic sub-test includes 27 words that were used for the assessment of all consonants and vowels. They administrated their test on 387 children in Tehran [21]. Few studies that have been carried out on speech sound acquisition in Persian, have used researcher made tools in which the psychometric properties are not evaluated fully or are performed on relatively small samples [22,23]. There are several studies that reported typical children having some inconsistency in speech sound production [24–30]. Consequently, it seems crucial to provide more than one opportunity for each speech sound position to be assessed in speech sound production instruments. There are several instruments for the assessment of the accuracy of speech sound productions that provide more than one word for each speech sound position in English [31]. Such an assessment tool with these characteristics is not available in Persian. By contrast, the difference in perceptual and motor characteristics of phonemes [32] and the frequency of spoken sounds in different languages [33], and that the use of only a phonetic context for each sound position may not show a very clear picture of children's speech production skills [34,35], we decided to test for evaluation. We designed and validated speech sound production for more than one word per sound position and also assess consonant clusters and vowels for Persian speaking children. Persian language has some special features that we will further explain in this study.

1.1. Persian Speech sound system

Persian (also called Farsi) is one of the Indo-European languages. It is a branch of the Indo-Iranian language. It is the main language in Iran and largely used in some countries such as Afghanistan (known as Dari), Tajikistan, Uzbekistan (called Tajiki), and the Pamir mountain region. There are some Farsi speakers in Europe and the United States of America. About 110 million people worldwide speak the Persian language. It is estimated that 82–83% of Iranian people, speak Persian in Iran [36]. In Persian like English, words are formed from one or more than one syllables. Persian is known as a syllable-timed language and there are three syllable structures in Persian including CV, CVC and CVCC. There are 23 consonants and 6 vowels in Persian. Vowels are classified to short vowels (/æ/,/e/,/o/) and long (/a/,/i/,/u/) [37–39]. In Persian, vowels can't initiate the syllables and there is always a glottal stop/ʔ/as onset when words start with vowels. Another important point is that there aren't syllable initial consonant clusters in Persian and there are only syllable-final consonant clusters [32].

2. Materials and methods

2.1. Study design

The current study is a methodological and cross sectional study.

2.2. Participants

In this study we recruited 525 typically developing, monolingual Persian-speaking children, in the age range of 3–5 years. 25 children for the pilot study, 400 children for the administration of the final version of the test and 100 children for the convergent validity were included in this study by cluster sampling. Tehran was divided into three areas: north, south and center. In each geographical area, nursery schools were selected randomly for sampling and finally children were selected randomly from nursery schools. Children were divided into four groups with 6-month intervals: Group 1 (36–41 months), Group 2 (42–47 months), Group 3 (48–53 months) and Group 4 (54–59 months). Inclusion criteria were Monolingual Persian speaking children that aged between 3 and 5 years old. Exclusion criteria were: walking age higher than 18 months, hearing impairment, delayed speech and language development, orofacial disorders such as cleft lip and palate, autistic spectrum disorders, cerebral palsy, mental retardation. The diagnosis was based on examination and observations of experienced speech and language pathologists, reports of parents and teachers in nursery schools, children's medical records and available information that was obtained from a form that parents completed about different stages of communication, speech and language development of the child.

2.3. Phase I: development of the test material

2.3.1. Item generation

To develop a valid test, the items were selected carefully from the existing resources by an extensive review [21–23,40–47]. There aren't vowels for the initial position and there aren't all of the vowels in the final position in picturable words in Persian, so we considered vowels only in the medial positions. Consonants (in the initial, medial and final positions), vowels (in medial position) and consonant cluster (CVCC)