



Original Article

Preparation and Validation of Persian Word/Non-Word Lists for Assessing Repetition Skills in Preschool Children

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ABSTRACT

Background: In the Persian language, limited tasks measure the skill of repeating real words along with non-words. However, clinical centers need such tests to investigate speech and language problems in children accurately. The present study prepared two real-word/non-word lists, and their psychometric properties were determined.

Methods: This methodological and cross-sectional study involved preparing 120 speech contexts (60 words and 60 non-words), which were then divided into two equivalent lists (List 1 and List 2). The content validity of these lists was determined. To check consistency and reliability, the lists were administered in two sessions at one-week intervals to 50 normal children aged 4 to 6 years from preschool centers in Ahvaz city. The children were asked to repeat each speech context after hearing it. Cronbach's alpha, test-retest reliability, and equivalent form reliability were calculated.

Results: The content validity ratio of both lists was 1. Cronbach's alpha coefficients for Lists 1 and 2 were 0.792 and 0.790, respectively. The repeatability coefficients for Lists 1 and 2 were 0.70 and 0.71, respectively, and both were significant ($P=0.000$). The difference between the two lists' average scores was insignificant ($t=-0.67$, $P>0.05$). Age (but not gender) caused a significant difference in repetition scores.

Conclusion: The prepared real-word/non-word lists for evaluating repetition skills are valid and reliable. They can be used for clinical and research purposes in Persian-speaking preschoolers, especially those aged 4 to 5.

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Introduction

Repetition of speech refers to the ability to restate what has been heard, whether meaningful or meaningless. This ability requires the listener to correctly pronounce the received vocal stimulus, generating a similar output in their vocal system [1, 2]. Various functions, such as language learning, phonological working memory, and

reading, are associated with repeating real words and nonwords [3]. Researchers consider meaningful linguistic contexts, such as real words, as an index of lexical competencies. In contrast, nonwords, which follow the structural rules of a language but have no semantic value, are seen as an index of phonological competencies [4, 5].

Logan posits that both words and nonwords create mental associations, and repetition helps consolidate these associations [6]. Performing tasks that involve repeating both words and nonwords requires several common skills, including speech perception, motor planning, phonological short-term memory, and long-

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term linguistic knowledge. However, these tasks differ in their reliance on phonological short-term memory. When lexical effects are controlled, nonword repetition primarily depends on phonological short-term memory. In contrast, word repetition activates phonological forms from lexical representations stored in long-term memory, including phonological and semantic knowledge [4, 7].

Accordingly, measuring nonword repetition skills has become one of the most widely used psycholinguistic tasks [1, 4, 8, 9]. Research has shown that nonword repetition significantly correlates with the lexical skills of children who typically learn language; children who repeat nonwords more accurately also achieve higher scores in standard assessments of receptive vocabulary [10]. Nonword repetition is also sensitive to a wide range of language disorders, as it involves multiple skills, including speech perception, phonological encoding, phonological memory, phonological representation, motor planning, and expression. Impairments in any of these skills can disrupt accurate repetition [8]. Another advantage of the nonword repetition task is that it minimizes dialectal and cultural biases [11].

The use of real words has also proven useful in previous studies. When using words, repetition accuracy increases compared to nonwords due to the influence of long-term knowledge on temporary word storage [12]. Dispaldro highlighted the importance of using real words, concluding that even if the distinguishing power of word repetition is low in research, the vulnerability of word repetition competency in those with disorders is greater than in the normal population [1]. For example, children with specific language impairments often face problems in lexical and phonological processes, and the ability to recognize and repeat words and nonwords is impaired [4].

Researchers studying the importance of real word repetition often encounter the challenge of reducing or eliminating the learning effect. Chiat and Roy suggested that for a more precise investigation of performance in repetition tasks, the performance of repeating nonwords should be compared to that of words [13].

Overall, phonological working memory, which is involved in both word and nonword repetition, is associated with a wide range of linguistic skills, such as learning new words and vocabulary development, maintaining information during sentence processing and discourse, and acquiring reading skills [14]. Additionally, research suggests that improving nonword repetition can enhance the ability to acquire reading and writing skills [15-17]. Therefore, word and nonword repetition is essential for speech, language, reading, and writing.

So far, various repetition tasks have been designed and validated in other languages. For example, Gathercole et al. in England prepared the Children Nonword Repetition Test, which included 40 items for 4-9-year-old English-speaking children [7]. Santose and Boeno validated the Brazilian Children's Test of Repetition of Pseudowords for 4-10-year-old Portuguese children [18]. Gardner et al. in England prepared ten nonwords as part of the Grammar and Phonology Screening Test for 4-8-year-old children [19]. Chiat and Roy in England developed a preschool repetition test for 2-4-year-old children, which

included 18 words and 18 nonwords [13].

In Persian, several repetition tests have been designed for children, primarily focusing on nonword speech contexts. For example, Sayyahi et al. designed a nonword repetition test to explore the phonological active memory capacity of 4-year-old children [20]. Afshar et al. also prepared a nonword repetition test for 4-6-year-old children [21]. These tests included 25 nonwords, each ranging from one to four syllables. Additionally, Mousavi et al. developed a test of 40 nonwords with one to three syllables to examine the phonological active memory capacity of 7-10-year-old children [22]. However, no test evaluating nonword and word repetition skills in children has been found in Persian.

This study aimed to prepare and investigate the reliability and validity of two lists containing both words and nonwords for preschool children. These lists can be used for screening purposes, evaluating repetition skills, and planning treatment for clients with dyslexia or language development disorders [19].

Methods

This research is a methodological and cross-sectional study aimed at developing and validating two word/nonword repetition lists for 4-6-year-old preschool children in Ahvaz city. Initially, existing tasks evaluating word and nonword repetition in Persian were examined [20, 23, 24]. The required meaningful and meaningless speech contexts were collected considering the psycholinguistic factors affecting word and nonword repetition skills, such as phonological unit length (number of syllables), articulatory-phonetic complexity, and first consonant variety.

First, meaningful words were selected. Based on established rules for creating nonwords in the available literature—such as changing one or two phonemes of the meaningful word, matching the phonological construction to the Persian language, ensuring dissimilarity to any specific word in Persian, and avoiding the transference of any concept in the subject's mind [23], suitable nonwords were prepared. Accordingly, 120 speech contexts, including 60 words and 60 nonwords, were created and divided into equivalent lists (List 1 and List 2). Each list contained 60 items: 20 monosyllabic contexts (10 words and ten nonwords), 20 disyllabic contexts (10 words and ten nonwords), and 20 three-syllable contexts (10 words and ten nonwords).

Expert opinions were utilized throughout the process of selecting the items for the lists and confirming their suitability. The experts included three speech therapists with at least a master's degree who were familiar with the research objective.

Next, the content validity of Lists 1 and 2 of the word/nonword repetition task was determined based on the opinions of five other speech therapists with a master's degree or higher by calculating the content validity ratio (CVR). Each expert was asked to evaluate each item using a three-point Likert scale: "essential," "useful but not essential," and "not essential." The CVR for each item was then calculated [25].

After preparing the lists and determining their content validity, a pre-evaluation was conducted with ten normal 4-6-year-old preschool children to confirm the compatibility of the speech contexts with the competencies of this age group.

To explore test-retest reliability, the lists were administered in two sessions, with a one-week interval, to 50 normal 4-6-year-old children. The sample size was determined through analysis during the execution phase after collecting data from 10 children using G*Power software. The children were selected based on convenience sampling from preschool centers in Ahvaz City. Inclusion criteria were monolingual Persian-speaking children with general health, normal intelligence quotient (IQ), and normal hearing (verified through the children’s records in the preschool centers and the hearing health questionnaire of the phonological awareness skills test, “ASHA-5” [24]). The absence of speech and language problems that could impair the child’s speech was confirmed by recording a sample of continuous speech and having it assessed by two speech therapists. The Wepman Auditory Discrimination Test [26] was also administered to all children. Exclusion criteria included any unwillingness by the parent or child to participate or complete the tasks.

Before implementing the lists, written informed consent was obtained from the parents of the children, following the approval of the research committee of Ahvaz Jundishapur University of Medical Sciences (IRAJUMS.REC.1399.484) and adhering to ethical considerations. The research team covered commuting costs and provided each child with a free speech therapy consultation.

Each child was tested individually in the acoustic room of the Speech Therapy Clinic at the Rehabilitation Faculty, Ahvaz University of Medical Sciences. The testing conditions were identical for all subjects. The tester provided instructions to each child, explaining: “I will say several words, some of which may not have specific meanings. Please repeat each one that you hear.” The tester presented the words, stated four test items, and then administered Lists 1 or 2 of the word/nonword repetition task.

In each session, either List 1 or List 2 was administered, with a 15-minute rest period in between. The order of presentation of the lists was alternated in each session. During testing, the tester sat 0.5 meters behind the child [20]. No corrective feedback was provided to any child.

If a child responded incorrectly or said, “I don’t know,” the tester responded with a neutral verbal reaction (e.g., “Okay,” “All right”) and proceeded to the next item.

All children’s responses were recorded as voice files. Two speech therapists who were research team members analyzed and scored these recordings. If the inter-rater agreement was less than 85%, the assessors reviewed the responses together and reached a consensus.

Scoring was as follows: a correct response, where the child maintained the phonological sequence, received 2 points; imitating the target speech context’s intonation, received 1 point; and an incorrect response, received 0 points. Therefore, the maximum possible score for each list was 120.

The data were entered into SPSS 22 for analysis. Test-retest reliability was calculated using the intraclass correlation coefficient (ICC), while the correlation between equivalent forms was assessed using the Pearson correlation coefficient. Internal consistency for each list was determined using Cronbach’s alpha. The significance level was set at 0.05.

Results

In this study, after preparing the word/nonword Lists 1 and 2, the content validity ratio was calculated for each list. The mean CVR for List 1 was 1.00, and for List 2, it was 0.96. The expert panel identified three problematic items and corrected and re-evaluated them, resulting in a final CVR of 1.00 for List 2.

During the pre-assessment stage, ten children (5 boys and five girls) with normal development were tested. The mean score for List 1 was 116.8, with a standard deviation (SD) of 3.05, while for List 2, the mean score was 113.3, with an SD of 5.33.

To calculate reliability and internal consistency, each list was administered twice to 50 normal 4-6-year-old Persian-speaking children (27 girls and 23 boys). Scores increased in the 5-6-year-old group compared to the 4-5-year-old group. Table 1 presents descriptive data from each administration are presented in Table 1.

The investigation of internal consistency for each list revealed that Cronbach’s alpha coefficient was 0.792 for List 1 and 0.790 for List 2.

Test-retest reliability and equivalence of versions were calculated for each list across different age groups and all subjects, with the results presented in Table 2.

Table 1: Descriptive Data of Persian Word/Non-Word Lists 1 and 2 (n=50)

Age range	Word/non-word lists	Implementation order	Mean	SD	Min.	Max.
4-5 years old (n=25)	1	1st	114.76	3.32	104	119
		2nd	113.64	3.86	101	119
	2	1st	114.84	2.85	106	119
		2nd	114.52	2.47	109	119
5-6 years old (n=25)	1	1st	116.40	2.68	110	120
		2nd	115.08	3.79	108	120
	2	1st	116.92	2.59	110	120
		2nd	116.92	2.18	112	120
All participants	1	1st	115.58	3.05	104	120
		2nd	114.36	3.85	101	120
	2	1st	115.88	2.89	106	120
		2nd	115.72	2.60	109	120

Table 2: Reliability Results of Persian Word/Non-Word Lists 1 and 2 (n=50)

Age range	Word/non-word lists	Test-retest reliability		Equivalent versions reliability	
		ICC	Sig.	r	Sig.
4-5 years old (n=25)	1	0.72	0.002	0.6	0.002
	2	0.70	0.003		
5-6 years old (n=25)	1	0.62	0.010	0.53	0.006
	2	0.54	0.035		
All participants	1	0.70	<0.001	0.43	0.002
	2	0.71	<0.001		

ICC: Intra class Correlation Coefficient

The intraclass correlation coefficients for Lists 1 and 2 across all individuals were 0.70 and 0.71, respectively, statistically significant ($P=0.000$). The ICCs for each age group were also significant, with higher values observed in the 4-5-year-old group. The ICCs for each speech context (word or nonword) were significant in all cases and were greater than 0.61, although the coefficient for nonwords in List 2 was 0.50 ($P<0.01$).

The Pearson correlation coefficient between the scores of equivalent lists for word and nonword repetition (Lists 1 and 2) was 0.43 ($P=0.002$), indicating a significant correlation. Finally, a paired t-test confirmed no significant difference between the mean scores of Lists 1 and 2 ($P=0.51$, $t=-0.67$).

The effect of demographic variables, such as age and gender, on word/nonword Lists 1 and 2 scores was analyzed using independent t-tests. The results showed no significant difference between the scores of boys and girls for List 1 ($t=-0.06$, $P=0.95$) and List 2 ($t=-1.21$, $P=0.23$). In contrast, age had a significant effect on the scores. Performance differed significantly between the age groups for List 1 ($t=-1.95$, $P=0.05$) and List 2 ($t=-2.69$, $P=0.01$).

Discussion

The abilities of repetition and imitation are fundamental components of a child's cognitive development. Repetition of a speech stimulus (whether meaningful or unmeaningful) underlies the development of speech and language, which in turn contributes to better academic skills [20, 22, 23]. This study aimed to develop and validate two equivalent lists of word/nonword repetition tasks and to investigate their psychometric properties.

After collecting and preparing the repetition lists, their content validity was assessed, yielding a mean content validity ratio of 1 for each list. According to the literature, this value is acceptable and indicates good agreement among experts regarding the selected speech contexts of each list individually [27-30].

The internal consistency of each list was also evaluated, with Cronbach's alpha coefficients of 0.70 and above for each list. Studies suggest that a correlation coefficient between 0.75 and 0.90 is suitable for the internal consistency of test items [21, 31], confirming the good internal consistency of the items within each word/nonword repetition list.

In examining test-retest reliability, the intraclass correlation coefficient for the total scores of consecutive administrations of both Lists 1 and 2 was approximately 0.70, both being significant ($p<0.001$). According to existing findings, this value of the repeatability coefficient indicates a high level of external consistency of the

scores across consecutive administrations [32]. However, when examining ICCs across different age groups, the reliability of the lists was good for the 4-5-year-old subjects and moderate for the 5-6-year-old subjects. Additionally, ICCs for the different speech contexts within the lists were average. In other words, the scores from each prepared list showed greater reliability overall, particularly in the younger age group. In contrast, in other conditions, scores should be interpreted with caution. Furthermore, considering the degree of repeatability reported for nonword repetition tests in Persian [20, 22], in cases where only nonword repetition is of interest, other available tests may be used for assessments.

The equivalency of Lists 1 and 2 was also evaluated. The findings indicated an average level of equivalency in the performance of children on List 1 compared to List 2, with higher equivalency observed in 4-5-year-old children [33]. Based on these results, caution should be exercised when using the two lists to assess children's performance before and after language therapy and further research is needed. However, given that no word/nonword repetition test with two equivalent lists exists in Iran, the prepared lists and their results are significant. Among the available repetition tests abroad, only Gathercole et al. (1994) designed two tests, which were not equivalent as they were created for two separate age groups of five and seven years [7].

The effects of age and gender on children's word/nonword repetition performance were also examined as a secondary finding. The results, consistent with Cychosz et al., [34], indicated that age significantly affects children's repetition skills. This is because repetition skills are linked to the phonological loop capacity of working memory and the size of children's lexical resources. In contrast, gender did not significantly influence children's repetition performance levels.

The coincidence of this study with the peak outbreak of COVID-19 and the subsequent closure of preschool centers posed a significant challenge. This limited the number of available subjects and those willing to participate, making random sampling impossible. Given the importance of word/nonword repetition skills in diagnosing and screening various language and speech impairments, it is recommended that the validity of these lists be evaluated with a larger sample size and in different cities. Additionally, their psychometric properties should be determined for groups with specific disorders.

Conclusion

The two researcher-made word/nonword lists, 1

and 2, for assessing repetition skills in preschool children demonstrated suitable reliability and validity. Considering the findings presented in this paper, these lists can be utilized in clinical settings and for research purposes. They can be used alongside other assessments available for screening and measuring the linguistic-cognitive skills of preschool children.

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Conflict of Interest: None declared.

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