

# *Research on Speech Repetition Tasks in Mandarin Preschool Children*

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**Abstract:** In recent years, some verbal repetition tasks have gained much attention, such as non-word repetition and digit-span. A large number of studies have concluded that these repetition tasks have the ability to differentiate between children with speech and language disorders and typically developing children. Moreover, they are closely related to a variety of language skills, especially vocabulary skills. Many studies have also used a combination of several speech repetition tasks to examine which task has the highest accuracy in diagnosing children with language disorders. However, there is a lack of research on Mandarin Chinese. The aim of this study is to investigate the performance of Mandarin-speaking preschool children, aged 3-6 years, in three repetition tasks: word repetition, nonword repetition, and digit span. The goal is to provide new insights for the screening of Mandarin-speaking children with language disorders.

## 1. Introduction

Difficulties in language development among children are often associated with lower academic performance and can also lead to social and emotional problems. These negative impacts can persist for a long time, even into adolescence ([1, 2]). However, if language problems can be addressed prior to starting primary school, the negative impacts caused by language impairments can be significantly reduced ([3]). Therefore, timely identification of language issues in children and providing professional support is crucial in reducing the risk of language disorders and minimizing the negative consequences associated with language difficulties. However, early screening for delayed language development in preschool children, especially those aged 3-4 years, is a challenging task due to the considerable variability and instability observed in their language development ([4]).

There is a pressing need to develop effective screening tools for the identification of children at risk of language disorders, enabling them to receive timely support from speech-language therapists. Nonword repetition has been widely regarded as a task that can meet the aforementioned objectives. Research conducted in various languages has demonstrated the effectiveness of nonword repetition in distinguishing children with language disorders from those with typical development (e.g., [1, 5]). These studies suggest that nonword repetition is associated with children's phonological short-term memory.

The challenges experienced by children with language disorders in performing this task stem from

their difficulties in phonological short-term memory. As a result, tasks that measure children's phonological short-term memory are often used as indicators of their language abilities ([6, 7]). These tasks include word repetition, nonword repetition, and digit span. However, outside of English, there is a lack of experimental research confirming the effectiveness of these speech repetition tasks in differentiating children with language disorders from those with typical development. Research on these tasks in the context of the Chinese language is particularly scarce ([8-12]). Language disorders in Chinese are still a relatively new field of study, and there are only a few diagnostic tools available for assessing language pathology in Mandarin-speaking children. The Chinese language lacks efficient screening tools for evaluating children's language abilities. The development of tools incorporating nonword, digit, and word repetition tasks for screening Chinese language abilities would be of great significance. However, before designing such tools, it is necessary to examine the performance of typically developing children on these tasks to establish a baseline and interpret the performance of children with atypical development. Therefore, this study aims to draw upon existing research on nonword repetition in Western languages, develop suitable repetition tasks for Chinese children, and investigate their performance, thus providing a reference for the development of scientifically sound screening tools for assessing Chinese language abilities.

## 2. Methods

### 2.1. Participants

A total of 32 children participated in this study, all of whom were enrolled in a kindergarten located in Xicheng District, Beijing. All participants were native Mandarin speakers and used Mandarin as their primary language both at home and at school.

### 2.2. Experimental Material

The speech repetition tasks utilized in this study included word repetition, nonword repetition, and digit span. For word repetition, commonly used Mandarin words with two to five syllables were selected. There were 5 items for each syllable length, resulting in a total of 25 words and 70 syllables. The words were recorded according to natural intonation patterns. Digit span involved randomly selecting digits from 0 to 9 to create numbers ranging from two to nine digits. Each digit length consisted of five sets. The test started with two-digit numbers and progressively increased in length up to nine-digit numbers. For example, 64, 379, 5129, etc. Nonword repetition tasks were divided into two categories: high wordlikeness and low wordlikeness. Each category contained 20 nonwords, resulting in a total of 40 nonwords. The high wordlikeness nonwords were composed of morphemes in Mandarin that could be legitimately spelled but had no meanings, such as “láng tè”. The low wordlikeness nonwords consisted of syllables that did not conform to the rules of Mandarin phonetic combinations, such as “túi giào”.

## 3. Results

After collecting the experimental data from the participants, the performance of the participants in word repetition, digit span, and nonword repetition tasks was analyzed using SPSS 21.0.

The statistical data revealed significant age effects in all three speech repetition tasks across the three age groups. Both word repetition and digit span tasks showed a progressive improvement with increasing age in all three groups of children, indicating a trend towards increased maturity. The two types of nonword repetition tasks were the focus of this study, and the experimental results demonstrated that all three groups of participants performed better in these tasks with higher age.

Therefore, the three speech repetition tasks designed in this study effectively differentiate typical developmental children across various age stages.

Moreover, the participants demonstrated the best performance in word repetition and nonwords with high wordlikeness, while their performance was poorest in repeating nonwords with low wordlikeness. From a statistical perspective, the performance trend observed across the three groups of children was: words > nonwords with high wordlikeness = digits > nonwords with low wordlikeness ( $p < 0.001$ ). Additionally, this study observed a word length effect in nonwords with both high wordlikeness ( $p = 0.000 < 0.05$ ) and low wordlikeness ( $p = 0.000 < 0.05$ ), indicating that nonwords with shorter syllables were easier to repeat compared to nonwords with longer syllables in both nonword repetition tasks.

From the perspective of nonwords with high wordlikeness, the three groups of children did not show any significant differences in performance for two-syllable nonwords ( $p > 0.05$ ), but there were significant differences observed for three, four, and five-syllable nonwords ( $p < 0.05$ ). On the other hand, for nonwords with low wordlikeness, the three groups of children already exhibited differences in performance for two-syllable nonwords, and significant differences were observed for three, four, and five-syllable nonwords as well ( $P_s < 0.05$ ). This suggests that the influence of word length is larger in tasks involving nonwords with low wordlikeness compared to those with high wordlikeness.

The interaction between syllable length and age was also observed. The experimental data indicated that the three-year-old group exhibited the largest variation in accuracy as syllable length increased. In contrast, the four-year-old and five-year-old groups showed smaller variations in accuracy with changes in syllable length compared to the three-year-old group. Therefore, the impact of increasing length was greater on the younger three-year-old children compared to the four-year-old and five-year-old groups. Additionally, post hoc tests revealed significant differences between the three-year-old group and the two older groups, both in terms of repetition of nonwords with both high and low wordlikeness, resembling the performance observed in word repetition and digit span. However, no statistically significant differences were found between the four-year-old and five-year-old groups.

Pearson correlation coefficient analysis was employed to calculate the correlation among various speech repetition tasks. The results indicated significant positive correlations between word repetition and the other three tasks. Specifically, participants who performed well in word repetition also demonstrated better performance in tasks involving nonwords with high wordlikeness, digits, and nonwords. However, the correlation between word repetition and nonwords with high wordlikeness ( $r = 0.693$ ,  $p < 0.01$ ) was stronger compared to its correlation with nonwords with low wordlikeness ( $r = 0.662$ ,  $p < 0.01$ ) and digits ( $r = 0.543$ ,  $p < 0.01$ ), highlighting the influence of wordlikeness. The correlation between digit span and nonwords with low wordlikeness was higher than its correlation with the other two tasks, suggesting a closer relationship between these two measures and a greater reliance on phonological short-term memory ability. Furthermore, the correlation between the two types of nonwords was the strongest among all correlations, with a high correlation between nonwords with high and low wordlikeness ( $r = 0.850$ ,  $p < 0.01$ ), which is undoubtedly significant.

#### 4. Discussion

The purpose of this study was to design repetition tasks tailored to the characteristics of Mandarin Chinese, including nonwords, words, and digits. This investigation aimed to explore the distinct features exhibited by three groups of participants in different speech repetition tasks and validate whether the performance of Mandarin-speaking preschool children aligns with conclusions found in English and other language studies.

Primarily, this study identified differences among the participants in the three tasks. The

performance of the three groups of children was found to be better in tasks that relied more on vocabulary knowledge and long-term memory, specifically in word repetition and high wordlikeness nonword repetition. On the other hand, their performance was comparatively inferior in tasks that relied less on long-term memory, such as digit span and low wordlikeness nonword repetition.

Furthermore, this study revealed age effects among the three groups of participants across the three speech repetition tasks, which aligns with previous research conducted in Western languages. Thus, this study provides evidence from Mandarin Chinese for related investigations. It also suggests that the designed speech repetition tasks have a good discriminative ability among children of different age groups. However, the age differences in performance among the three groups were mainly observed between the three-year-old group and the two older age groups (four-year-old group and five-year-old group), with no statistically significant difference observed between the two older age groups.

In addition, this study also observed the word length effect, consistent with findings from Western research. As the syllable length of words and nonwords increased, along with the increase in the number of digits in digit span, the participants' accuracy in repetition decreased. Previous studies have indicated a link between memory span and word length effect ([13, 5, 6]), providing an explanation for the challenges in repeating longer words. This finding contributes Mandarin Chinese evidence to the measurement of phonological short-term memory in nonword repetition, consistent with previous research ([14, 8, 9]).

In addition, a significant interaction effect was observed between word length and word type (nonwords and words). The accuracy of all three groups of participants decreased as the syllable length increased in both word and nonword repetition tasks. However, across all word lengths, the performance of the three groups of children was better in word repetition compared to nonword repetition.

Lastly, this study also examined the correlations among the three tasks. Significant correlations were observed between word repetition, digit span, and high and low wordlikeness nonword repetition tasks. A notable correlation was observed between words and both categories of nonwords, however, the correlation was more pronounced between words and the group with lower wordlikeness nonwords in comparison to the group with higher wordlikeness nonwords. Interestingly, the correlation between digit span and word repetition was less strong than the correlation between digit span and nonword repetition, and there was a robust correlation between digit span and the group with lower wordlikeness nonwords. This could be attributed to participants' familiarity with digits and their distinctive phonetic attributes, aiding in accessing certain levels of long-term knowledge during digit span. Additionally, the correlation between the two types of nonwords was the most robust among all tasks. Undoubtedly, those who performed well in repeating the high wordlikeness nonwords also exhibited relatively good performance in repeating the low wordlikeness nonwords, while those who struggled with the high wordlikeness nonwords also showed poorer performance with the low wordlikeness nonwords.

## 5. Conclusions

In this study, the performance of Mandarin-speaking preschool children in tasks involving repetition of words, digits, and nonwords was examined. The nonword task used in this study also revealed age effects, length effects, and word class effects consistent with Western research. This suggests that the performance of Mandarin-speaking children in these speech repetition tasks bears some similarities to the participants in previous Western studies. These three tasks are simple, easy to administer, and unbiased, thereby having the potential to differentiate children at different ages and with varying language abilities. This exploration provides valuable insights for clinical screening

and diagnostic tools for language disorders. In future studies, it would be beneficial to include a group of children with language disorders to examine their performance in these tasks, aiming to investigate the accuracy and specificity of these tasks in diagnosing language disorders and their potential as diagnostic tools for assessing Mandarin language proficiency.

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## References

- [1] Eadie P., Conway L., Hallenstein B., Mensah F., Mckean C. & Reilly S. (2018) *Quality of life in children with developmental language disorder. International Journal of Language and Communication disorders*, 53(4), 799–810.
- [2] Jing Jin. (2021). *How to Interpret Children's Language and Communication Disorders. Chinese Children Health Care*. 925-931.
- [3] Conti-Ramsden G., Durkin K., Simkin Z. & Knox E. (2009) *Specific language impairment and school outcomes. I: Identifying and explaining variability at the end of compulsory education. International Journal of Language and Communication Disorders*, 44(1), 15–35.
- [4] Henrichs J., Rescorla L., Schenk J.J., Schmidt H.G., Jaddoe V.W., Hofman A., et al. (2011). *Examining continuity of early expressive vocabulary development: the generation R Study. Journal of Speech, Language and Hearing Research*, 54(3).
- [5] Stokes SF, Wong AM, Fletcher P, Leonard LB. *Nonword repetition and sentence repetition as clinical markers of specific language impairment: the case of Cantonese. J Speech Lang Hear Res*.2006 Apr; 49 (2):219-36. doi: 10.1044/1092-4388(2006/019). PMID: 16671840.
- [6] Gathercole S. E., Willis C, Baddeley A. D., & Emslie H. (1994). *The Children Test of Nonword Repetition: A test of phonological working memory. Memory*, 2, 103-127.
- [7] Gathercole S.E., Hitch G.J., Service E., & Martin A.J. (1997). *Phonological Short-term memory and new word learning in children. Developmental Psychology*, 33, 966-979.
- [8] Yujun Chen., Huimei Liu. (2018). *Chinese Presechool Children's Performance on Nonword Repetition and Its Application for Clinical Diagnosis*. 43 (3), 57-81.
- [9] Naixin Li., Hintat Cheung. (2014). *Phonological Analysis Facilitates Nonword Repetition in Young Children. Chinese Journal of Psychology*, 56(3): 359-381.
- [10] Xiaopin Long. (2015). *A Study on Non-word and Sentence Repetition in Children with Specic Language Impairment.[Thesis]. Guangdong University of Foreign Studies*.
- [11] Yingxue Pan. (2019). *Non-word and Sentence Repetition of Mandarin Chinese Children with Special Language Impairment and High-Functioning Autistic Children [Thesis], Guangdong University of Foreign Studies*.
- [12] Xiaoqing Wang., Jiandan Han. (2016). *Non-Word Repetition Performance in Mandarin-Speaking Preschool Children with and Without Specifi c Language Impairment (SLI). Chinese Journal of Applied Linguistics*, 39 (3), 337-375
- [13] Archibald L. M. (2008) *The promise of nonword repetition as a clinical tool. Canadian Journal of Speech-Language Pathology and Audiology* 32, 21-28.
- [14] Zixia Jiang. (2017). *The impact of wordlikeness and scoring method on Mandarin children's performance on nonword repetition*. 2:171-181.