Proceedings of the 6th International Conference on Education Innovation and Psychological Insights
DOI: 10.54254/2753-7048/2025.ND34312

Phonetic Teaching for Native Mandarin-Speaking Children Learning English: The Influence of Working Memory and Auditory Processing

Ruoyi Wu

College of Education, University of Leeds, Xuzhou, China
wuruoyi2004@163.com

Abstract. In the context of increasing globalization, proficiency in English has become an important ability for children in East Asia, which will enhance their crucial competitiveness in future learning and growth. However, for children whose native language is Mandarin, due to the basic phonetic system differences between English and Mandarin, it has become a great challenge for children to master English pronunciation. Previous studies have emphasized that working memory is an important aspect of language learning. Another important factor related to speech acquisition is auditory processing skills. This article reviews the current research status of speech teaching, with a focus on the interaction between working memory and auditory processing ability, and how to support and limit speech teaching for children whose native language is Mandarin. Moreover, this article also discusses how to enhance and formulate pronunciation teaching strategies for children whose native language is Mandarin, especially regarding working memory and auditory processing ability.

Keywords: Working Memory, Auditory Processing, Phonetic Learning, Second Language Acquisition

1. Introduction

In language learning, especially when learning a second language, working memory and auditory processing skills both play a crucial role. Baddeley [1] defined working memory as a system that helps people quickly obtain and store information and provides a fundamental source of information for people's thinking. In addition, Moossavi et al. [2] defined auditory processing as the ability to help humans quickly and clearly separate simple information from complex and noisy information, extracting useful information to aid comprehension. Auditory processing is extremely important for people in their work, study, and daily life, as it may affect their speech abilities. However, current research mainly focuses on working memory and auditory processing ability alone, without delving deeper into the connection and mutual influence between these two factors. However, Moossavi et al. [3] proposed the mutual influence between auditory ability and working memory. The study found that auditory processing has different aspects of connection with working memory during use. He proposed that working memory can help process auditory stimuli. This means that auditory

DOI: 10.54254/2753-7048/2025.ND34312

processing can help children better distinguish the effective information they hear from the distractions they receive, and can also identify the directions of the sounds they hear. Meanwhile, there are currently few studies focusing on how to help children improve their working memory and auditory processing through training and intervention [4]. This article reviews the existing literature on the research of working memory and auditory processing, pays more attention to the process of how these two are related, and also reviews the use of teaching methods to improve the phonetic learning of children whose native language is Mandarin in learning English.

2. The role of working memory in phonetic learning

Harrington [5] suggested that working memory has an independent role in the learning of a second language. In line with this notion, Service [6] highlighted the critical role of working memory in second language acquisition of phonology, particularly as it relates to the ability to approximate more precise phonology. This suggests that working memory has an influence not only over the short-term memory involved in acquiring a second language, but also influences the communicative output and input in everyday language. At the same time, a range of studies have also confirmed this assertion. Research shows that second language learners generally do not achieve the fluency of native speakers. Hence, they are engaged in processing information with greater concentration, putting more strain on their working memory [5]. This suggests that second language learners are not often able to process information at the same speed as a native speaker. For native speakers, they are processing the language information they receive automatically during communication; the learners must focus more on analyzing and interpreting language, which can increase the demands that it places on working memory capacity, especially in more complicated and less familiar language contexts. Janaina Weissheimer [7] conducted a more in-depth examination of working memory in the second language acquisition process. The research finds that second language learners with higher working memory capacity produce greater second language acquisition ability compared to learners with lower working memory capacity. In simple terms, children with better working memory capabilities tend to have a tendency to become masters of languages they have little familiarity with compared to children who have weak working memory capabilities. This also means that second language learners require more of their working memory capabilities since this subsequently affects the speed and quality of their language acquisition. Baddeley [8] proposed that the capacity of working memory varies with the age of the child due in large part, to language capacity increase as the child grows.

3. The influence of auditory processing skills on phonetic learning

Auditory processing ability is another important contributor to phonetic learning ability. Research clearly states that auditory processing ability is important for second language acquisition, particularly in phonetic recognition and pronunciation accuracy [9]. Saito et al. [10] conducted a study involving English learners whose first language was Chinese. They found that the better the participants performed on the auditory processing task, the more they improved in both pronunciation accuracy and fluency. In simple terms, research clearly states, auditory processing ability is highly pertinent to the phonetic aspect of a second language. Students with higher auditory processing ability may better detect the phonetic aspect that can facilitate their language ability. They therefore maintain that auditory processing ability is an important contributor to learning the phonetic aspect of a second language. Kachlicka et al. [11] also studied the impact of auditory processing ability on second language learning. In their study, they showed that auditory processing

DOI: 10.54254/2753-7048/2025.ND34312

ability, by far, was the most important factor impacting on second language learning. In fact, this single factor can be accepted as one of the most valid forms of determining success in learning a second language that can outweigh the age or other major descriptive variables. In sum, Kachlicka et al. [11] emphasize that auditory processing ability is the most important factor in second language learning and that improving auditory learning ability can enhance the efficiency of learning a language. Saito et al. [12] would take this further in independent research, whereby Saito et al. [12] would research three primary forms of Auditory processing training; Auditory Only, Phonetic-Only, and Auditory Phonetic. The findings showed that all types of Auditory processing training improved learning effect. But, the difference in training types had slightly different differences in learning effect, for example, Phonetic-Only facilitated participant improvements in English vowel accuracy.

4. Teaching methods for improving working memory on phonetic learning

St Clair-Thompson et al. [13] conducted a study that discussed whether training with Memory strategies could improve children's working memory. The researchers mainly used a computer game called "Memory Booster" on children. The purpose of this game is to enable children to use some different strategies to remember the information they need to remember. The research results show that the training of working memory strategies has brought great help to children in terms of phonology and other aspects. This indicates that systematic memory strategy training can enhance children's working memory and also help them improve the efficiency of processing information.

5. Teaching methods for improving auditory processing skills on phonetic learning

Auditory perception training is a teaching method widely used to enhance auditory processing ability. Scharine et al. [14] proposed that having acute hearing is an important ability needed by human beings, and promoting auditory ability requires certain stimuli. Studies have shown that when the stimulation intensity is high enough, it can stimulate human auditory ability. In simple terms, human auditory ability varies according to the frequency of stimuli received by humans. The stimulus training method proposed by Hodson et al. [15] is that children are trained when they hear a specific speech, such as the words composed of /r/ in English, and these words will be amplified in sound so that children can hear these speeches more clearly, thereby helping to improve their perception ability of speech. However, Winitz [16] proposed another auditory stimulation training method, which involves playing a recording to children with distinct differences to enhance their recognition of different speech sounds and improve their speech perception ability through repeated training. However, Rvachew [17] found that all these training methods were difficult for children to complete these training for a long time. Therefore, on this basis, it was discovered that computer-assisted auditory training all effectively avoided this drawback, and children were more willing to participate in this training.

6. Discussion

At present, a large number of studies have demonstrated the significant role of working memory in second language acquisition. Research indicates that stronger working memory can help children develop more explicit phonetic abilities. Children whose native language is not English lack the automatic processing ability of language when learning English pronunciation. Therefore, they need more resources to analyze and output language, which also requires them to have higher working memory [5, 6]. In addition, Janaina Weissheimer's [7] research indicates that learners with higher

DOI: 10.54254/2753-7048/2025.ND34312

working memory capacity typically perform better in language acquisition. In addition, auditory processing ability is regarded as another key factor affecting speech acquisition. Saito et al. [10] studied the differences among three auditory training methods and found that Phonetic-Only training is more capable of helping children improve the accuracy of vowels. Regarding teaching intervention, research has found that the use of computer-assisted auditory perception training can more comprehensively stimulate and assist children in participating in training and improving their speech ability.

7. Conclusion

At present, a large number of studies have demonstrated the significant role of working memory in second language acquisition. Research indicates that stronger working memory can help children develop more explicit phonetic abilities. Children whose native language is not English lack the automatic processing ability of language when learning English pronunciation. Therefore, they need more resources to analyze and output language, which also requires them to have higher working memory [5, 6]. In addition, Janaina Weissheimer's [7] research indicates that learners with higher working memory capacity typically perform better in language acquisition. In addition, auditory processing ability is regarded as another key factor affecting speech acquisition. Saito et al. [10] studied the differences among three auditory training methods and found that Phonetic-Only training is more capable of helping children improve the accuracy of vowels. Regarding teaching intervention, research has found that the use of computer-assisted auditory perception training can more comprehensively stimulate and assist children in participating in training and improving their speech ability

References

[1] Baddeley, A. (2003a). Working memory and language: an overview. Journal of Communication Disorders, 36(3), 189–208. https: //doi.org/10.1016/s0021-9924(03)00019-4

[2] Moossavi, A., Mehrkian, S., Lotfi, Y., Faghihzadeh, S., & sajedi, H. (2014a). The relation between working memory capacity and auditory lateralization in children with auditory processing disorders. International Journal of Pediatric Otorhinolaryngology, 78(11), 1981–1986. https: //doi.org/10.1016/j.ijporl.2014.09.003

[3] Moossavi, A., Mehrkian, S., Lotfi, Y., Faghihzadeh, S., & sajedi, H. (2014b). The relation between working memory capacity and auditory lateralization in children with auditory processing disorders. International Journal of Pediatric Otorhinolaryngology, 78(11), 1981–1986. https: //doi.org/10.1016/j.ijporl.2014.09.003

[4] Carretti, B., Caldarola, N., Tencati, C., & Cornoldi, C. (2013). Improving reading comprehension in reading and listening settings: The effect of two training programmes focusing on metacognition and working memory. British Journal of Educational Psychology, 84(2), 194–210. https: //doi.org/10.1111/bjep.12022

[5] Harrington, M. G. (1992a). Working Memory Capacity as a Constrainton L2 Development. 123–135. https: //doi.org/10.1016/s0166-4115(08)61491-0

[6] Service, E. (1992). Phonology, Working Memory, and Foreign-language Learning. The Quarterly Journal of Experimental Psychology Section A, 45(1), 21–50. https: //doi.org/10.1080/14640749208401314

[7] Janaina Weissheimer. (2025). THE ROLE OF WORKING MEMORY CAPACITY IN THE DEVELOPMENT OF L2 SPEECH PRODUCTION. IlhaDoDesterro: A Journal of English Language, LiteraturesinEnglishandCulturalStudies, 60, 75–104. https: //www.redalyc.org/articulo.oa?id=478348698004

[8] Baddeley, A. (2003b). Working memory: looking back and looking forward. Nature Reviews Neuroscience, 4(10), 829–839. https: //doi.org/10.1038/nrn1201

[9] Ruan, Y., & Saito, K. (2023). Less precise auditory processing limits instructed L2 speech learning: Communicative focus on phonetic form revisited. System, 114, 103020. https: //doi.org/10.1016/j.system.2023.103020

[10] Saito, K., Sun, H., & Tierney, A. (2020). Domain-general auditory processing determines success in second language pronunciation learning in adulthood: A longitudinal study. Applied Psycholinguistics, 41(5), 1083–1112. https: //doi.org/10.1017/s0142716420000491

DOI: 10.54254/2753-7048/2025.ND34312

[11] Kachlicka, M., Saito, K., & Tierney, A. (2019). Successful Second Language Learning Is Tied to Robust domain-general Auditory Processing and Stable Neural Representation of Sound. Brainand Language, 192(1), 15–24. https: //doi.org/10.1016/j.bandl.2019.02.004
[12] Saito, K., Petrova, K., Suzukida, Y., Kachlicka, M., & Tierney, A. (2022). Training auditory processing promotes second language speech acquisition. Journal of Experimental Psychology: Human Perception and Performance, 48(12), 1410–1426. https: //doi.org/10.1037/xhp0001042
[13] St Clair-Thompson, H., Stevens, R., Hunt, A., & Bolder, E. (2010). Improving children's working memory and classroom performance. Educational Psychology, 30(2), 203–219. https: //doi.org/10.1080/01443410903509259
[14] Scharine, A., Cave, K., & Letowski, T. (2009). Auditory perception and cognitive performance. Helmet-mounted displays: Sensation, perception, and cognition issues, 391-489.
[15] Hodson, B. W., & Paden, E. P. (1983). Targeting intelligible speech: A phonological approach to remediation.
[16] Winitz, H. (1969). Articulatory acquisition and behavior.
[17] Rvachew, S. (1994). Speech Perception Training Can Facilitate Sound Production Learning. Journal of Speech, Language, and Hearing Research, 37(2), 347–357. https: //doi.org/10.1044/jshr.3702.347