PsychCorp

Volume 10, Issue 5 February 2016

EBP briefs

A scholarly forum for guiding evidence-based practices in speech-language pathology

Assessment of Speech-Production Skills in Bilingual Mandarin-English Speaking Children: Difference vs. Disorder

Emily Wang, MA, CF-SLP
Irvine Unified School District, Irvine, CA

Kelly Farquharson, PhD, CCC-SLP
Emerson College, Boston, MA

ALWAYS LEARNING

PEARSON

EBP Briefs

Cite this document as:
Wang, E. & Farquharson, K. (2016). Assessment of speech-production skills in bilingual Mandarin-English speaking children: Difference vs. disorder. *EBP Briefs, 10*(5), 1–8. Bloomington, MN: NCS Pearson, Inc.

PEARSON

For inquiries and reordering:
800.627.7271
www.PearsonClinical.com

NCS Pearson, Inc. 5601 Green Valley Drive Bloomington, MN 55437

Produced in the United States of America.

1.A

Structured Abstract

Clinical Question: When assessing speech sound production of bilingual Mandarin-English speaking children, are standardized measures or informal assessment procedures better for determining whether the child has a speech sound disorder or speech sound difference?

Method: Systematic Review

Study Sources: Google Scholar, American Speech-Language-Hearing Association's (ASHA) journal database

Search Terms: bilingual children AND Mandarin-English, phonological acquisition AND Chinese, and bilingual assessment AND Mandarin-English

Number of Studies Included: 2

Primary Results:

Bilingual Mandarin-English speaking children tend to follow the same phonological patterns as their monolingual Mandarin and monolingual English speaking peers.

There are certain phonological processes that are not common in English but may be present in Mandarin (e.g., initial-consonant deletion).

A Mandarin word list is available for an informal assessment of phonology and should be paired with a dynamic assessment procedure.

Conclusions: Information regarding the speech-production skills of bilingual Mandarin-English children remains scarce, with a paucity in the number of standardized assessments that could be used to evaluate these children. With the increase of Mandarin-English speakers in the United States, it is prudent to explore methods for sensitive assessment of speech-production abilities. Presently, there are empirically derived developmental norms available. By pairing these data with empirically supported approaches, such as dynamic assessment, clinicians are able to conduct a comprehensive assessment that is sensitive and culturally appropriate.

Assessment of Speech-Production Skills in Bilingual Mandarin-English Speaking Children: Difference vs. Disorder

Emily Wang
Kelly Farquharson

Clinical Scenario

Kristin is a bilingual Mandarin-English speaking speech-language pathologist on the assessment team at a local preschool. She has just been assigned to complete a full assessment on Ethan, a male child age 3 years 1 month in her preschool who has been referred for concerns with speech intelligibility. Ethan is an only child who lives with his parents and maternal grandmother; his parents report that he is exposed to both Mandarin and English. His father speaks only English to Ethan, but his mother and grandmother speak to Ethan primarily in Mandarin. Ethan's preschool teacher reported that he is difficult to understand compared to his peers. His parents agreed to the evaluation as they also noted that Ethan is difficult to understand.

Kristin knows that there are several possible causes for Ethan's deficits with speech intelligibility. As such, she decides to administer the Clinical Evaluation of Language Fundamentals Preschool – Second Edition (CELF® Preschool–2; Wiig, Secord, & Semel, 2004), as well as the Goldman-Fristoe Test of Articulation—Third Edition (GFTA™–3; Goldman & Fristoe, 2015), and asks Ethan's parents to fill out a speech and language questionnaire.

Results from Ethan's evaluation revealed a CELF Preschool–2 core language score of 89 and a GFTA–3 standard score of 72. In English, Ethan was able to produce the majority of the speech sounds that are considered appropriate for his age; however, he used several phonological processes that are considered developmental, as well as some that are nondevelopmental (e.g., initial-consonant deletion). The parent intake form revealed that Ethan is difficult to understand, even at home. Ethan's parents reported that they try to offer suggestions to Ethan when they cannot understand him, but that often causes Ethan to become frustrated. His parents indicated that it appears that Ethan understands directions and generally seems to understand what his parents are saying to him.

Kristin realized that some of Ethan's speech sounds during the GFTA–3 administration sounded like Mandarin speech sounds, but she cannot be sure if there is truly a second language influence. She does not have a standardized Mandarin articulation assessment, nor does she know the typical development of speech sounds for Mandarin-speaking children.

Because Kristin is bilingual, she frequently incorporates a dynamic assessment approach (Bialystok, Luk, Peets, & Yang, 2010; Gutiérrez-Clellen & Peña, 2001; Laing & Kamhi, 2003), which allows for various levels of prompting from the clinician to establish how the child learns. This approach to assessment can help to eliminate linguistic biases that are often present in standardized tests (Laing & Kamhi, 2003). However, this approach has primarily been applied to language testing and Kristin is unsure of how to apply it to speech sound testing. Kristin is also concerned that an informal assessment would not allow her to obtain the standard scores that she needs to qualify Ethan for services.

Kristin decides to conduct a literature search for evidence regarding assessment of bilingual children with hopes of locating a Mandarin articulation test, finding speech sound development norms for Mandarin-speaking children, and determining if informal approaches, such as dynamic assessment, would be appropriate in assessing Ethan.

Background Information

The number of Mandarin speakers over 5 years of age in the United States has increased by 345% from 1980 to 2010 (U.S. Census Bureau, 2013). Currently, much of the research conducted on bilingual children has primarily looked at children learning two Indo-European languages such as French-English and Spanish-English (Lin & Johnson, 2010), despite the growing population of Mandarin-English speakers. Furthermore, within the United States, it is reported that 28% of children between the ages of 0 and 4 currently reside in a household where a second language other than English is spoken in the home setting (Kominski, Shin, & Marotz, 2008). Therefore, it has become evident that not only are the language needs of bilingual children increasing significantly, but also that the greatest supports for language are needed within the

preschool and kindergarten age groups as they are exposed to English during this time.

Research pertaining to Mandarin-English speaking children has focused primarily on bilingual children in other countries (e.g., Malaysia, Australia, China). It may be difficult to generalize this research to bilingual Mandarin-English speaking children in the United States given differences in dialect in both Mandarin and English. Furthermore, while more research studies on monolingual children have been conducted, this research on monolinguals has been applied as a metric for determining the presence of a language disorder in bilingual children (Gildersleeve-Neumann & Goldstein, 2012), which may not adequately reflect the speech sound development of bilingual children, particularly bilingual Mandarin-English speaking children. Research by Stow and Dodd (2005) has also suggested that approximately 50% fewer referrals are made for bilingual children when compared to their monolingual peers, indicating that bilingual children tend to be underrepresented in speech therapy caseloads. Conversely, Stow and Dodd (2005) also suggested that bilingual children tend to be overrepresented in speech therapy caseloads due to lack of information pertaining to whether a child presents with a speech and language difference or disorder. Therefore, the identification of an assessment process to adequately meet the needs of a bilingual child is necessary in order to ensure that children who need to receive specialized services do receive those services, and children who are learning to use multiple languages during their formative years are not incorrectly labeled as having a speech and language disorder.

While the research on developmental norms for speech sound production in monolingual English-speaking children is quite robust, there is a dearth of similar research for Mandarin monolingual and bilingual children. Research pertaining to monolingual Mandarin-speaking children has indicated that these children tend to follow a universal trajectory in which they master tones, followed by syllable final consonants, followed by syllable final vowels, and finally syllable initial consonants in that order (Hua & Dodd, 2000). This is different than that of their monolingual English-speaking peers, who tend to first develop speech sounds in word-initial position, with stop and nasal consonants being acquired earlier than other consonant categories (Stoel-Gammon & Dunn, 1985). The interaction between these two trajectories for bilingual speakers remains unknown.

Clinical Question

Kristin's primary concern in her assessment of Ethan is that she is not adequately capturing whether Ethan truly has a speech sound disorder or if this is a difference in speech sound production given his exposure to two languages within his home setting. Kristin wants to ensure that she is following best practices and using the best evidence possible during her assessment. However, she is concerned that informal measures will not allow her to obtain the standard score that she needs to qualify a child for services. Thus, Kristin decides to the use the PICO (population, intervention, comparison, and outcome; Straus & Sackett, 1998) framework to specify her question:

P – Bilingual Mandarin-English speaking children
I – assessing speech sound production using standardized measures
C – incorporating informal assessment procedures
O – determining speech sound disorder or difference

The proposed clinical question is: When assessing speech sound production of bilingual Mandarin-English speaking children, are standardized measures or informal assessment procedures better for determining whether the child has a speech sound disorder or speech sound difference?

Search for Evidence

Kristin began her search process by establishing exclusionary and inclusionary criteria.

Exclusionary Criteria:

- Reviews or studies with nonexperimental designs
- Participants included children who were exposed to or spoke dialects other than Mandarin (e.g., Cantonese)
- Included information on countries where Mandarin is a primary language but not specifically China or Taiwan (Information from bilingual children in other countries may present with dialectal and cultural differences.)
- Discussed phonological awareness or processing, as this was not of immediate relevance
- Referred to children with language disorders or other concomitant diseases and/or disabilities such as hearing loss

Inclusionary Criteria:

- Featured an experimental, quasi-experimental, single-subject experimental, case-study, or correlational design

- Included information on monolingual or bilingual Mandarin-speaking children from China and/or Taiwan (Ethan's parents and grandparents were from those two countries.)
- Specifically discussed phonological acquisition in monolingual or bilingual Mandarin-speaking children
- Referred to children with speech sound disorders only
- Were written in English

Kristin selected two databases to identify research related to speech and language development in bilingual Mandarin-English speaking children. She used Google Scholar and the American Speech-Language-Hearing Association's (ASHA) journal database to facilitate her search primarily because of their availability to speech-language pathologists.

The search terms that Kristin used for searching both of the databases included: bilingual children, Mandarin-English, Chinese, phonological acquisition, and bilingual assessment. The first two terms (bilingual children + Mandarin-English) yielded a total of 30 articles that broadly related to the phonological patterns found in Mandarin-English bilingual children. Of those 30 articles, 2 were removed as possible sources because they focused on bilingual children from other countries (e.g., Singapore), 2 were excluded as they focused on phonological awareness, another 2 articles looked at bilingual children with a concomitant disorder, 4 articles looked at the acoustic properties of phoneme development, and 19 more articles discussed English or Mandarin as a second language and how it affects phonological awareness, spelling, vocabulary, literacy, and orthography in each respective language. From this first search, Kristin was able to locate 1 article that addressed her specific clinical question regarding phonological development in the bilingual Mandarin-English population.

Kristin conducted a second search to find articles documenting phonological development in monolingual Mandarin speakers. This second set of search terms (phonological acquisition + Chinese) yielded 19 results. Of those articles, 18 were excluded; 10 of the articles were related to phonological awareness, 2 articles were conducted on bilingual children in countries that spoke other dialects of Mandarin (e.g., Hong Kong), 2 articles were written in another language, 1 article was a biographical sketch, and 3 articles discussed Mandarin development of orthography and tones.

A third set of search terms (bilingual assessment + Mandarin-English) yielded four articles pertaining to best-practice approaches in assessing bilingual children, as well as articles not directly related to Mandarin-English speaking children. Since the assessment articles (n = 4) were not specific to Mandarin-English, they were not included as part of Kristin's evidence-based decision but they did provide valuable information on potential assessment approaches that could be carried over to Mandarin-English bilinguals.

The searches resulted in two articles for Kristin to review. This article search process is depicted in Figure 1.

Evaluating the Evidence

Kristin selected two studies (Hua & Dodd, 2000; Lin & Johnson, 2010) to review in her search for best-practice assessment approaches in determining the presence of a speech sound disorder in bilingual Mandarin-English speaking children. Both studies reported on the phonological development of monolingual and/or bilingual Mandarin-speaking children. Kristin evaluated the results of each study by considering threats to validity and overall quality based on the evidence-based framework set forth by Dollaghan (2004) and the levels of evidence outlined in Gillam and Gillam (2006).

The two studies included a total of 177 children between the ages of 1:6 and 5:0. Hua and Dodd (2000) recruited children from nursery schools and kindergartens in Beijing, China. They were deemed to be typically developing per parent report and were learning Mandarin as their first and primary language. Of the 48 Taiwanese participants in Lin and Johnson (2010), 25 children were recruited from an English immersion preschool where the children were considered to be typically developing sequential English language learners, while the other 23 participants were attending a Chinese language school and were considered to be monolingual Mandarin speakers with very little, if any, exposure to English.

Hua and Dodd (2000) assessed the phonological development of the children by administering a bespoke Mandarin word list consisting of 44 words. This word list reflected all possible Mandarin tones and speech sounds, including consonants and vowels, in all word positions. These words were chosen based on the observation of their overall familiarity with young children, as well as the possibility of finding images that would elicit the desired target word from the children. The authors noted that this method was necessary in locating target words for their study due to the lack of information pertaining to the frequency distribution of speech sounds in Mandarin.

Furthermore, phoneme distribution within the self-generated word list was also varied.

Results from Hua and Dodd (2000) showed that monolingual Mandarin-speaking children mastered vowels early in development, possibly due to the fact that most words in Mandarin end in vowels. Given that Mandarin vowels contain monophthongs, diphthongs, and triphthongs, the most common vowel process included vowel reduction from triphthongs to diphthongs, and diphthongs to monophthongs. In general, the vowel sound that remained after the reduction process tended to be the vowel that received primary stress. Tone errors were extremely rare, possibly given that tones carry meaning in Mandarin. Each change in tone has the possibility of eliciting an entirely new word. Hua and Dodd (2000) also noted, however, that analysis of tone acquisition based on a picture-naming task did not necessarily indicate whether or not a child had learned the rules pertaining to changes in tone in Mandarin, also known as tone sandhi. Mastery of all syllable-initial consonants (90% accuracy) occurred by age 4:6. The first sounds to be mastered were nasals, possibly due to the fact that nasals in Mandarin are present in both word-initial and word-final position, whereas all other consonants are only legally placed in word-initial position. A detailed chart documenting mastery of syllable-initial consonants at both 75% and 90% in Mandarin-speaking children from the ages of 1:6 through 4:6 was generated. Hua and Dodd (2000) also analyzed common phonological processes and found that initial-consonant deletion was quite common in younger children, with other processes including fronting, backing, and gliding. And finally, in terms of final consonants, only five possible processes could be identified given that Mandarin only has two consonants that can occur in the word-final position. Analysis of these consonants revealed that children were most often deleting the word-final /ŋ/, or replacing /n/ with /ŋ/.

Kristin considered the quality of this study per the recommendations for applying evidence-based practices (Dollaghan, 2004, 2007; Gillam & Gillam, 2006). The study was well controlled in terms of participant selection, age range cut-offs, and phonological-analysis procedures. The results are descriptive in nature, in that they provide detailed information regarding the overview, emergence, and stabilization of phonological acquisition for monolingual Mandarin-speaking children. This article would best be described as Level III (correlational) according to Gillam and Gillam (2006), as it provides systematic information regarding the various age ranges at which consonants, vowels, and tones develop. Kristin noted that this study was not experimental in nature and thus does not provide comparative data regarding the benefits of any particular assessment approach over another. For her purposes, this article does provide normative data and is similar to what has been reported for monolingual English-speaking children (Smit, Hand, Freilinger, Bernthal, & Bird, 1990).

Lin and Johnson (2010) conducted a study of monolingual Mandarin-speaking and bilingual Mandarin-English speaking children that was largely based on results from Hua and Dodd (2000). The same 44-word list consisting of consonants and vowels in all word positions and representing all available tones in Mandarin was used, as was the Goldman-Fristoe Test of Articulation – Second Edition (GFTA-2; Goldman & Fristoe, 2000). Results from Lin and Johnson (2010) indicated that by ages 4 to 5 years, all of the Mandarin-English speaking children had reached mastery (90%) of Mandarin speech sounds as well as English speech sounds. Additionally, analysis of common phonological processes revealed that the percentage of bilingual children who still used these processes was low, given that development of speech sounds was already mastered in both languages. The authors examined the top 10 phonological processes (Hua & Dodd, 2000) present in the 4- to 5-year-old age group. The most common phonological processes in the bilingual children included final-consonant deletion, devoicing of final consonants, weak-syllable deletion, and stopping.

Even though the bilingual children were considered to be sequential language learners and had only been exposed to the English language for approximately a year and a half, a percentage of consonants correct (PCC) analysis still yielded high accuracy rates. It is important to note, however, that PCC was calculated based on single-word responses, which may not adequately reflect articulatory complexity and phoneme accuracy as it pertains to connected speech.

The presence of several phonological patterns was believed to be due to Mandarin influence on the children's English development. For instance, the prevalence of final-consonant deletion could be attributed to the lack of final consonants present in Mandarin in comparison to English. Whereas Mandarin only has 2 final consonants, English has approximately 23. Additionally, several grammatical markers in English were missing, including the use of plurals, which could be due to the fact that plurals do not exist in the Mandarin language or could be the process of final-consonant deletion.

In evaluating the Lin and Johnson (2010) study, Kristin determined that it was also Level III (Gillam & Gillam, 2006) because it did not include experimental manipulation. It did, however, compare the speech production of monolingual Mandarin-speaking children to bilingual Mandarin-English speaking children. The groups were essentially equivalent across nonverbal intelligence and gender, but they did differ on age and time in preschool, with the bilingual group being younger and having spent more time in preschool. This difference may seem minor but it raises questions regarding the reliability of follow-up analyses conducted between the groups. However, given the dearth of research pertaining to the phonological development of bilingual Mandarin-English speaking children, Kristin was able to use the evidence provided to move forward in her analysis of Ethan's speech production skills.

The Evidence-Based Decision

Based on the two articles that Kristin found, she knows that bilingual Mandarin-English speaking children tend to follow the same phonological patterns as their monolingual Mandarin and monolingual English speaking peers (Lin & Johnson, 2010) and that there is an empirically supported word list that she can use in her assessment (Hua & Dodd, 2000).

To get a better picture of Ethan's speech sound production skills, Kristin administers the Mandarin word list from Hua and Dodd (2000). This list adds to her assessment because it contains every Mandarin speech sound in initial and final position, as well as vowels in all positions. Even though this word list was initially developed for monolingual Mandarin-speaking children, it has been empirically applied to bilingual Mandarin-English speaking children (Lin & Johnson, 2010) and allows Kristin to obtain useful data regarding Ethan's speech production. She is cautious with her interpretation of the results from this word list because it comprises words most commonly used by children in China and may not be representative of the frequency with which those words are used by bilingual Mandarin-English speaking children in the United States.

In addition, Kristin incorporates a dynamic assessment approach to examining Ethan's speech-production skills (Bialystok, Luk, Peets, & Yang, 2010; Gutiérrez-Clellen & Peña, 2001; Laing & Kamhi, 2003). Kristin decides to re-administer portions of the GFTA–3 using the tenets of dynamic assessment, specifically the "test-teach-retest" approach (Gutiérrez-Clellen & Peña, 2001). Kristin acknowledges that she will not be able to obtain a standard score from this assessment; however, she also knows she will gain useful information regarding the level of support Ethan requires in order to be successful. If the data support a diagnosis of a speech sound disorder, Kristin will be able to develop a treatment plan that capitalizes on Ethan's strengths, provides the amount of support that he needs, and utilizes empirical data regarding typical phonological development in Mandarin.

With her newfound information, Kristin feels more equipped to assess Ethan's phonological and language skills. Although the resources for such an assessment are rather scarce, Kristin feels empowered by the literature that she found and by her ability to adapt formal protocols and include empirically based informal measures to best meet the needs of her client. She will continue to exercise caution in her decision-making process, but she feels that these two new assessment tools (i.e., dynamic assessment, informal Mandarin word list from Hua & Dodd [2000]) have expanded her repertoire and will allow her to adequately use evidence to support her practice.

Authors' Note

The authors would like to acknowledge that this collaboration was made possible by the American Speech-Language-Hearing Association's Student to Empowered Professionals (STEP) mentoring program.

Emily Wang is a speech-language pathologist in the Irvine Unified School District. She recently graduated with her MA in communicative disorders from the Department of Human Communication Studies at California State University, Fullerton. She continues to be actively involved in research projects during her clinical fellowship year, with research interests in speech sound development in multilingual children.

Kelly Farquharson is a speech-language pathologist and assistant professor at Emerson College. She is the director of the Children's Literacy and Speech Sound (CLaSS) lab. Her primary research interests include literacy acquisition in children with phonological and language disorders and the possible cognitive underpinnings of phonological disorders.

Correspondence should be directed to Kelly Farquharson, Department of Communication Sciences and Disorders, Emerson College, 120 Boylston Street, Boston, MA 02116, kelly_farquharson@emerson.edu.

References

Bialystok, E., Luk, G., Peets, K. F., & Yang, S. (2010). Receptive vocabulary differences in monolingual and bilingual children. *Bilingualism: Language and Cognition, 13*(04), 525–531. http://doi.org/10.1017/S1366728909990423

Dollaghan, C. A. (2004). Evidence-based practice in communication disorder: what do we know, and when do we know it? *Journal of Communication Disorders, 37*(5), 391–400.

Dollaghan, C. A. (2007). *The handbook for evidence-based practice in communication disorders.* Baltimore, MD: Paul H. Brookes Publishing.

Gildersleeve-Neumann, C., & Goldstein, B. A. (2012). Intervention for multilingual children with speech sound disorders. In S. McLeod & B. Goldstein (Eds.), *Multilingual Aspects of Speech Sound Disorders in Children* (pp. 214–227). Bristol, UK: Multilingual Matters.

Gillam, S. L., & Gillam, R. B. (2006). Making evidence-based decisions about child language intervention in schools. *Language, Speech, and Hearing Services in Schools, 37*(4), 304–315.

Goldman, R., & Fristoe, M. (2000). *Goldman-Fristoe Test of Articulation–second edition.* Circle Pines, MN: American Guidance Service.

Goldman, R., & Fristoe, M. (2015). *Goldman-Fristoe Test of Articulation–third edition.* Bloomington, MN: NCS Pearson, Inc.

Gutiérrez-Clellen, V. F., & Peña, E. (2001). Dynamic assessment of diverse children: A tutorial. *Language, Speech, and Hearing Services in Schools, 32*(4), 212–224. http://doi.org/10.1044/0161-1461(2001/019)

Hua, Z., & Dodd, B. (2000). The phonological acquisition of Putonghua (modern standard Chinese). *Journal of Child Language, 27*(1), 3–42.

Kominski, R. A., Shin, H. B., & Marotz, K. (2008). *Language needs of school-age children.* Presented at the annual meeting of the Population Association of America, New Orleans, LA.

Laing, S. P., & Kamhi, A. (2003). Alternative assessment of language and literacy in culturally and linguistically diverse populations. *Language, Speech and Hearing Services in Schools, 34*(1), 44–55.

Lin, L. C., & Johnson, C. J. (2010). Phonological patterns in Mandarin-English bilingual children. *Clinical Linguistics & Phonetics, 24*(4–5), 369–386.

Smit, A. B., Hand, L., Freilinger, J. J., Bernthal, J. E., & Bird, A. (1990). The Iowa articulation norms project and its Nebraska replication. *Journal of Speech and Hearing Disorders, 55*(4), 779–798.

Stoel-Gammon, C., & Dunn, C. (1985). *Normal and disordered phonology in children.* Baltimore: University Park Press.

Stow, C., & Dodd, B. (2005). A survey of bilingual children referred for investigation of communication disorders: A comparison with monolingual children referred in one area in England. *Journal of Multilingual Communication Disorders, 3*(1), 1–23.

Straus, S. E., & Sackett, D. L. (1998). Using research findings in clinical practice. *British Medical Journal, 317*(7154), 339–342.

U.S. Census Bureau. (2013) *Language use in the United States: 2011.* Washington, DC: Government Printing Office.

Wiig, E. H., Secord, W. A., & Semel, E. (2004). *Clinical Evaluation of Language Fundamentals Preschool–second edition.* San Antonio, TX: Harcourt Assessment, Inc.

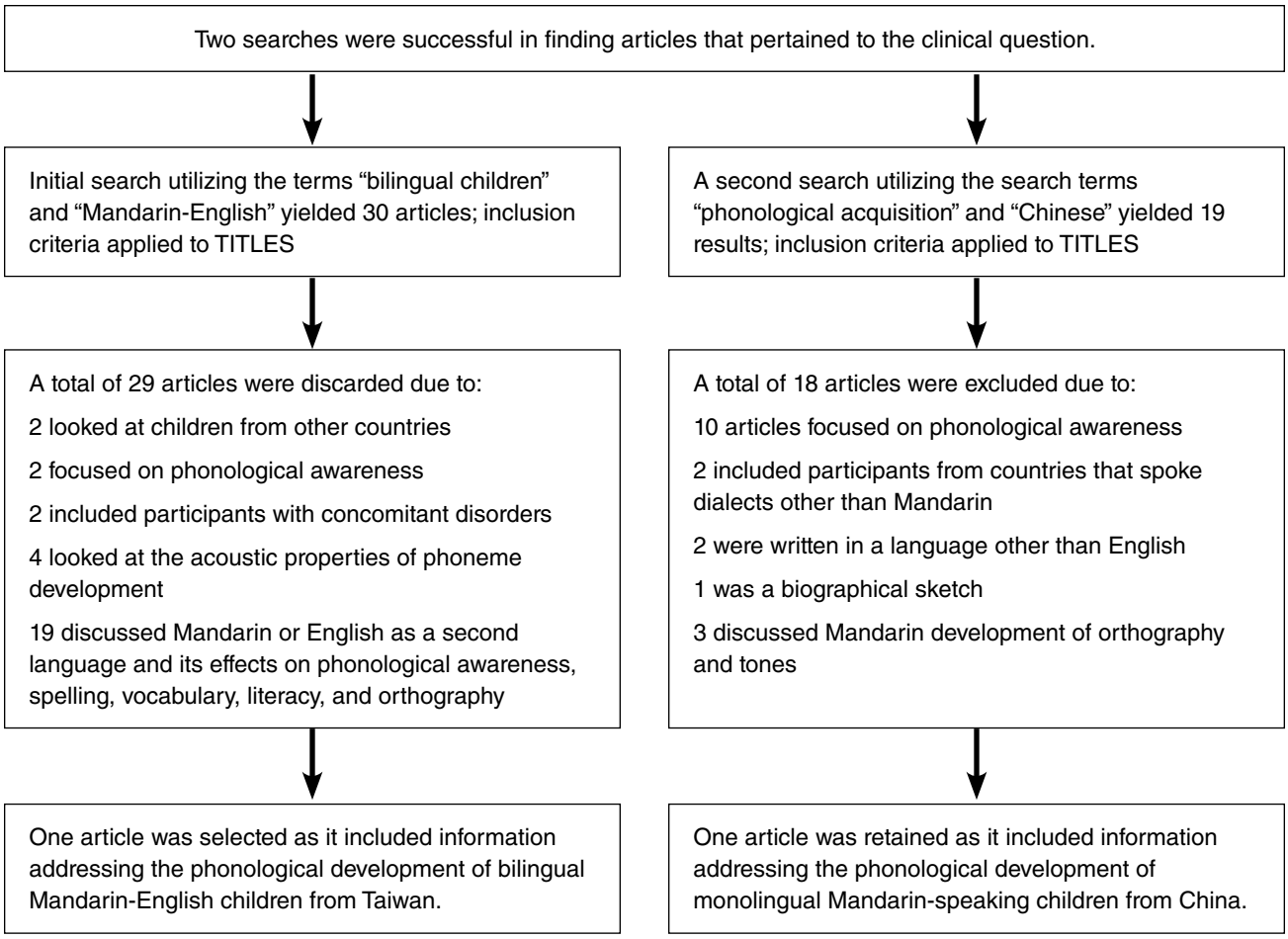

Figure 1. Article Selection Process

Table 1. Article Reviews

Reference	Design	Population	Intervention Design	Results
Hua, Z. & Dodd, B. (2000). The phonological acquisition of Putonghua (modern standard Chinese). *Journal of Child Language, 27*(1), 3–42.	Level III (Correlational Design)	129 typically developing children; monolingual Mandarin speakers recruited from Beijing, China	A Mandarin word list comprising 44 words targeting all possible consonants and vowels in all word positions, as well as tones was administered to each of the children.	Developmental trajectory of Mandarin phonology occurs in this order: 1) tones, 2) syllable-final consonants, 3) syllable-final vowels, 4) syllable-initial consonants. The most common phonological processes in monolingual Mandarin speakers include: 1) initial-consonant deletion, 2) fronting, 3) backing, and 4) gliding.
Lin, L. C., & Johnson, C. J. (2010). Phonological patterns in Mandarin-English bilingual children. *Clinical Linguistics & Phonetics, 24*(4–5), 369–386.	Level III (Correlational Design)	48 typically developing children in Taiwan; 23 of the 48 participants were monolingual Mandarin speakers, 25 were sequential bilingual Mandarin-English speakers	The same 44-word list used by Hua & Dodd (2000) was adopted for this study, as well as the Goldman-Fristoe Test of Articulation – Second Edition, to analyze English speech sound development.	Bilingual Mandarin-English speaking children reach 90% mastery of both languages by age 4–5 years. The most common phonological processes in bilingual children include: 1) final-consonant deletion, 2) devoicing of final consonants, 3) weak-syllable deletion, and 4) stopping.