

16 Intervention for a bilingual child with speech disorder

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Rationale

Bilingual cases are now commonplace in many Speech Language Pathology (SLP) clinics. For example, in Australia, over 23% of the population speak a language other than English at home (Australian Bureau of Statistics, 2012). Clinicians who work with developmental speech sound disorders (SSD) have on average nearly 10% of children on their caseload who “speak English as a second or other language” (McLeod & Baker, 2014). However, evidence-based guidelines for the management of such cases reflect the small research evidence base (e.g., International Expert Panel on Multilingual Children’s Speech, 2012).

A recent systematic review investigating the influence of bilingualism on speech production (Hambly et al., 2013) concluded that there are qualitative differences in the phonological development of typically developing bilingual children compared to their monolingual peers (e.g., more likely to use atypical speech substitutions and omissions). Only 13 of the studies reviewed described bilingual children with SSD. The review identified a number of factors that account for individual variation in bilingual children including “the types of languages spoken, the length and frequency of exposure to both languages and the child’s age and broader speech processing and memory skills” (Hambly et al., 2013, p. 14). This chapter presents a case study explaining how these factors influenced clinical assessment and intervention decisions for Kim, a child with unintelligible English speech who first acquired Vietnamese and then Australian-English at school.

Clinician’s context

Kim enrolled in Year 2 at a suburban Brisbane government school when he was 7 years old. In this setting, the government allocates SLP services to schools

according to school size, socio-economic area and other identified needs. Kim's school had an SLP present two days each week to assess and provide intervention to students with significant speech and language difficulties. Kim was referred to the first author, a teacher and SLP with 20 years' experience who recently completed a PhD on bilingual difference and disorder in sequentially bilingual children.

Child's context

Kim lives with his parents and siblings in a suburb of Brisbane, Australia. He is the youngest of three children, with two sisters older by four and six years. The family lived in Vietnam with the children attending school there until 2013. At this time (when Kim was 7 years old) the family emigrated to Australia. Kim's father continues to run a business in Vietnam and lives between the two countries. The rest of the family live predominantly in Australia but spend school holidays in Vietnam.

Kim's parents have limited English proficiency and require an interpreter to communicate with school staff. Interviews via an interpreter revealed that development of Kim's motor and feeding milestones were age appropriate. He started speaking at 12 months of age, with word combinations beginning at approximately 2 years. Despite starting at the expected age, Kim's speech was poor and difficult to understand throughout his preschool years. Although he understood what others said to him and knew what he wanted to say, Kim had great difficulty pronouncing words. To overcome this, Kim frequently augmented his communication with gestures and actions. Kim's speech intelligibility slowly improved over time. Generally, the family now understand what he says although some Vietnamese speech sounds remain prone to error which is quite noticeable to others.

Kim's family reported no other family member with speech difficulties. In particular, they noted that Kim's sisters have typical language development in Vietnamese, with no speech errors. Kim has no history of middle ear pathology or hearing loss. His hearing has been tested by an audiologist on several occasions with no abnormalities detected. He has no history of significant medical concerns. Kim did not receive SLP support in Vietnam, although the family took him to a paediatrician in 2013 because of their concern about Kim's intelligibility. The paediatrician diagnosed a tongue tie, and subsequently Kim's frenulum was cut. This occurred shortly before the family's move to Australia. The family were told that the operation "would

allow his brain to retrain his tongue". Although the effect of ankyloglossia on speech development has received little research attention it is considered unlikely to cause speech difficulties (Kummer, 2005).

Vietnamese was the only language spoken in Kim's home until the family moved to Australia. It continues to be the primary language of communication at home. The family had no exposure to English before moving to Australia. Both Kim's sisters were reported to have learned English quickly at school. Kim found this task more difficult. Kim's mother feels that Kim is less willing to take risks using English because his speech is difficult to understand. Kim's sisters now frequently use English to speak to each other at home. Kim prefers to use Vietnamese, even when his sisters and friends speak English to him. Kim has told his family that he prefers to speak Vietnamese at school where many of his friends also speak Vietnamese. Kim reports that his friends can understand him better when he uses this language.

Assessment

Research into typical phonological development shows that bilingual children develop two separate, but interacting, phonological systems (Core & Scarpelli, 2015; Hambly et al., 2013). Evidence for separateness includes observations that bilingual children do not use identical phonological error patterns in both their languages; contradictory processes are common (e.g., fronting /k/ to [t] in English but backing /t/ to [k] in Cantonese); shared phonemes acquired in one language but not in the other (e.g., /s/ correct in Cantonese, but realised as a stop in English); and awareness of the constraints of each language's phonological system (e.g., phonemes specific to one language were not used in the other language, Holm & Dodd, 2006). The interaction of the two phonological systems is interesting, particularly for bilingual children with a phonological impairment. It raises questions of whether a phonological disorder in one language will always be mirrored in the other.

The limited evidence indicates that bilingual children with articulation and/or phonological impairment have difficulties in both languages. If an articulatory error occurs in one language it will be evident on the same sounds in the other language (Holm et al., 1997a; Preston & Seki, 2011). In contrast, children with phonological impairments make errors that may be different in each language. The extent of a child's phonological delay in the two languages may differ but the child is not delayed in one language and disordered in the other; consistently used error patterns differ in each language (Holm et al.,

1997b). To date, research evidence suggests that bilingual children with speech difficulties have the same type of disorder in both languages. This finding indicates that deficits underlying these speech disorders are not language-specific but affect all languages learned.

Identification of speech impairment in bilingual children therefore requires detailed assessment of speech in both of the child's languages. This does not always happen in clinical practice. For example, speech assessment in both languages happens in fewer than half of all bilingual children's assessments in Australia (Williams & McLeod, 2012). Children are often assessed only in their second language because clinicians rarely speak a child's first language, often knowing little about its linguistic characteristics. There are few first language assessments available and access to interpreters can be difficult. The qualitative differences in the phonological development of bilingual children compared to their monolingual peers (Hambly et al., 2013) means that SLPs also face the theoretical uncertainty of having no normative bilingual phonological data for many languages pairs. This makes the process of discriminating 'normal bilingual phonology' (or possibly transient differences in phonological development) from disordered phonology very difficult (Holm & Dodd, 2006).

Speech and language assessment in Vietnamese

Kim commenced school in Australia early in September, 2013. After six months at school (age 8;4 years) he was referred for a speech assessment due to difficulties repeating English words. Vietnamese-speaking teachers and Kim's mother also reported error productions for some Vietnamese sounds. Kim's teacher described him as a very quiet student with limited English verbal output in the classroom setting.

The school SLP tested Kim's Vietnamese speech in collaboration with a Vietnamese staff member with a university degree in linguistics. Two assessment tasks were used. Production of single words was tested using a Vietnamese consonant word list and Vietnamese vowel word list (Hwa-Froelich, Hodson, & Edwards, 2002). Speech production in connected speech was also tested using a narrative retell task (based on the *Peter and the Cat Narrative Assessment*; Allan & Leitão, 2003). Kim listened to a story told in Vietnamese (with pictures) then retold the story in Vietnamese.

The Vietnamese-speaking staff member in collaboration with the school SLP recorded and analyzed Kim's speech on both assessment tasks. They noted the same consistent error patterns across both tasks:

- Reduction of /nj/ to [n]: e.g., [no] grapes; [nat] birthday
- Reduction of /t^h/ to [h]: e.g., [hôi] stop; [hi] is
- Stopping of /s/ to [d]: e.g., [dong] (river); [dap] (will); and /tʃ/ to [d], e.g., [di] (what); [do] (give).

A bilingual language assessment was also conducted at this time. The following measures were used:

- Vocabulary assessment used composite scoring (Hemsley, Holm, & Dodd, 2010, 2014). This investigated lexical development by administering a receptive vocabulary assessment (*Peabody Picture Vocabulary Test*; Dunn & Dunn, 2007) in both L1 and L2. Composite lexical composition was calculated by counting the total number of lexical items correctly identified in Vietnamese and/or English. As expected in a student with only six months' exposure to English, Kim's understanding of English vocabulary was limited; however, his receptive vocabulary in Vietnamese was much better developed. Overall, Kim obtained a composite score well within the average range for his age.
- A Vietnamese narrative retell task evaluated Kim's ability to use Vietnamese in an academic task. The Vietnamese-speaking staff member in collaboration with the school SLP recorded, transcribed and analyzed Kim's narrative. Analysis indicated that Kim was able to retell the story using a traditional narrative macro-structure including an introduction and setting, complication and resolution. Kim also produced a number of complex and simple sentence structures with no grammatical errors evident. He used appropriate vocabulary and referencing as well as a range of descriptive terms. Research indicates that these measures are indicators of typical language development (Justice et al., 2006; Squires et al., 2013) and as such no further assessment of Kim's language was indicated.

The school support team prioritized Kim for additional support with the school's 'English as an Additional Language' (EAL) teacher, a government-funded programme for students in their first three years of English exposure. Kim did not receive speech therapy as the school felt that his difficulties using English could be related to limited English exposure. Reticence to speak in the classroom was attributed to a 'silent period', which many sequentially

bilingual children experience when first exposed to a second language. This 'silent period' may be a time when a child develops receptive knowledge and experience in the second language before beginning to use it expressively (Bedore et al., 2005; Yip & Matthews, 2007).

Cognitive assessment

The school guidance officer administered the *Weschler Intelligence Scale for Children* (4th ed.; Wechsler, 2003). The report indicated that due to Kim's limited English language exposure a Full Scale Intelligence Quotient was not a valid measure of general cognitive ability. However, performance on nonverbal indices showed that Kim's perceptual reasoning, working memory and processing speed were all within the average range for his age. Kim demonstrated a particular strength in processing speed.

Speech assessment in English

After living in Australia for a total of nine months, Kim reportedly understood and used a wider range of English words; however, his speech remained largely unintelligible, even when using everyday highly-familiar vocabulary. Kim was subsequently referred for further speech assessment and intervention. Assessment was conducted at age 9;1 years using the *Diagnostic Evaluation of Articulation and Phonology* (DEAP; Dodd et al., 2002). This test provides a differential diagnosis of speech disorders, distinguishing between disorders of articulation, delayed phonological development, consistent phonological disorder and inconsistent phonological disorder. Each of these diagnoses is based on psycholinguistic research and an evidence-based intervention approach (Chapter 9). The diagnostic screen of the DEAP revealed that, on repetition of 10 words, Kim produced nine words inconsistently and with many errors. This led to further testing using the DEAP's Inconsistency, Phonology and Oromotor Assessments.

In the Inconsistency Assessment, Kim produced 25 words, on three separate trials, with each trial separated by another activity. This ensured that Kim's productions required online planning of each word's sequence of phonemes. Any inconsistency of production over the three words scored 1, while three identical productions scored 0. Of the 25 words produced, Kim produced 20 words (80%) differently across trials. Examples of Kim's productions included: [zʌ], [sæ], [sʌ] *shark*; [zribrʌ], [zibʌ], [ribʌ] *zebra*; [kæpu ninʌ], [bæku kinʌ],

[pæɪ nɪnɒ] *vacuum cleaner*; [kɪp], [ɕu], [ɕɪp] *chips*; [wɪt], [krɪ], [wɪst] *witch*. This result exceeded the criterion (based on normative data) of 40% for diagnosis of an inconsistent phonological disorder (IPD). Figure 16.1 shows there was no clear pattern to Kim's substitution patterns in English. However, final consonant deletion affected 13 of the 18 words with final consonants on the Inconsistency Assessment and this is reflected in the large number of omissions shaded on the matrix. The matrix also shows that for seven sounds there was only one alternative error substitution (e.g., /ʃ, ʒ/ was either correct or substituted by /s, z/); for four sounds there were two alternative error sounds; and for two sounds there were three alternative error sounds.

Kim's production of 10 of the 20 words produced inconsistently was either:

- Variation between a correct and the same incorrect production (for 5 items), e.g., [gə], [gɜ], [gɜl] *girl*; [kæŋɒwʊ], [kæŋgəru], [kæŋgəru] *kangaroo*; or
- Variation on only one target sound across the three productions (for 3 items), e.g., [sɪsɪ], [sɪsɪt], [sɪsɪt] *scissors*; [ɕɒɒm], [drɒm], [drɒm] *jump*; or
- Variation restricted to vowel changes (for 2 items): e.g., [daɪnʊsɔ], [daɪnʊsɔ], [daɪnəsɔ] *dinosaur*; [ɛɒfən], [ɛɒfən], [ɛɒfən] *elephant*.

These examples show that while consistent word plans were emerging for some words, they contained atypical errors (e.g., vowels, [dr] for /ɕ/, and [ɪt] for /əz/) that might generalise to other words, suggesting the need for intervention. In addition, there remained 10 words (40%) whose pronunciations was characterized by unpredictable errors.

The DEAP Phonology Assessment indicated that Kim's percent consonants correct (PCC) score was 60% and his percent vowels correct (PVC) score was 86%. Both these scores were well below normative monolingual data that indicate that vowels should be error free and PCC should be above 95%. Kim could imitate all English speech sounds and many sound sequences. During the Oromotor Assessment Kim was also able to imitate isolated and sequenced oral movements and could produce sequences of 'pa-ta-cake' fluently and at an adequate pace. Although sounds were at times sequenced incorrectly, the sounds produced were identifiable. Together, the results of the DEAP confirmed a diagnosis of IPD: although Kim was able to produce all speech sounds and had no oromotor difficulties, he made unpredictable speech errors.

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Bilabial/Anterior

Target Phonemes

Glottal/Posterior

Figure 16.1 Matrix of English phoneme substitutions.

Kim's realisation of individual phonemes in English are shown in this figure. The target phonemes are along the horizontal axis and the phonemes Kim used are along the vertical axis. ∅ indicates the sound was omitted. A child with consistent accurate speech would just have a single horizontal line (darker squares). An articulation error, or consistent phonological substitution would result in an uneven line but only one box would be shaded for each target sound. A child with inconsistent speech will have a range of boxes shaded for each of their variable errors. For example, the figure shows that Kim used p/b, f/v, k/g or omitted it when attempting to produce f/v in various positions in various words.

Interpretation of assessment results

Kim is a 'late sequential bilingual': he first learned Vietnamese and was then introduced to English after the 'primary language development' period (Kohnert, 2008). Although this bilingual group is slower to acquire a second language than early sequential bilinguals, speech intelligibility is generally not affected (Hemsley, Holm, & Dodd, 2006). Kim's speech profile does not fit with Hambly et al.'s (2013) conclusion that there is 'a lack of strong evidence to suggest that bilingual children develop speech at a slower rate than their peers' (p. 12).

Kim's case is unique in three ways: he is older than any other hearing child with IPD described in the literature; he acquired his second language as a late sequential bilingual; and he is the first Vietnamese-English bilingual with IPD to be described. Features of his phonological disorder are summarized below.

1. *Difficulties with phonology in L1 and L2*: Kim presented with a significant phonological disorder that affected both of his languages. Parents reported that Kim's speech had been highly unintelligible when he was young, and monolingual, in Vietnamese. The difficulties he experienced in English, then, were not caused by it being a second language. At the age of 8 he continued to have noticeable and, consistent phonological error patterns in his Vietnamese speech, although his Vietnamese was relatively intelligible at the time of the study.

2. *Inconsistent speech patterns*: Kim's English speech was characterized by significant inconsistency that made him highly unintelligible. He produced 80% of words differently across three trials of 25 single words. However, some of the characteristics of Kim's speech were not typical of 'inconsistent phonological disorder' (IPD) described for either monolingual children or bilingual children (Holm & Dodd, 2001; Holm et al., 2005b). The matrix of Kim's substitutions (see Figure 16.1) suggests that the types of variability may not be as random as it first appears. For example, five of the words that were inconsistent were variation between a single error production and the correct production. The substitution matrix also revealed a lot of variability within sound class (e.g., nasals: /m/ - /n/ - /ŋ/; sibilants: /ʃ/ - /s/ - /z/; glides: /r/ - /w/) and the omission of a large number of sounds (often these were final consonants).

Ten of Kim's sounds had no or only one alternative sound substitutions and there were no sounds that had more than three error

substitutions in his substitution matrix. In comparison, a bilingual Punjabi/English speaking child with inconsistent speech described in Holm and Dodd (1999a) using the same matrix analysis had 11 sounds with between four and seven alternative sound substitutions (e.g., /r/ was either correct or substituted with /w, l, j, m, n, ŋ, t, d, k, g). Kim's speech did not seem to have the extreme range of variability usually identified for other children with IPD.

3. *IPD in L2 but not L1*: Bilingual children with IPD previously reported were inconsistent in both of their languages (Holm & Dodd, 1999a, 1999b). However, Kim's Vietnamese was not currently inconsistent. It is not known whether he was inconsistent in his production of Vietnamese words when he was younger, or whether his speech was characterized by consistent phonological error patterns. The fact that his parents had great difficulty understanding him suggests he may have been inconsistent: often when children are consistently using error patterns their parents are able to 'tune in' to their own child's system and learn to understand it (Holm et al., 2005b).

Research supports the possibility that Kim may have initially presented with inconsistent speech in Vietnamese. In a longitudinal Irish study, seven children were identified with IPD at 3 years of age, but not treated (Wright, 2014). When reassessed at 5;11 years, one had age-appropriate speech, four consistently used delayed phonological error patterns and two had acquired articulation disorders. This suggests that children with IPD may develop consistent error patterns over time.

The two bilingual children with IPD previously reported were both younger and acquiring their two phonological systems in the period where phonological development is typically occurring (Holm & Dodd, 1999a, 1999b). In contrast, Kim had nearly eight years to develop his first phonological system before the second was introduced. There is no previously-reported case of a child who has had a phonological impairment in one language that has largely resolved prior to the introduction of a second language.

4. *A relatively high PCC*: Kim's pre-intervention PCC was 60%. This is surprisingly high given he was 80% inconsistent (i.e., a child with so much inconsistency would be expected to have relatively few consonants correct). In comparison, a group of 10 monolingual children with 40–60% inconsistency had PCC scores that ranged from 25–62% (Crosbie

et al., 2005). Of the bilingual children with IPD reported previously one had 56% inconsistency and 45% PCC (Punjabi/English; Holm & Dodd, 1999a) and one had 40% PCC (inconsistency was not assessed in the same way for this child) (Italian/English; Holm & Dodd, 1999b). Kim's PCC suggests that his errors affected fewer consonants within each word, in contrast to other children with IPD.

Kim's speech errors appear to be the result of an underlying phonological impairment. This impairment was evident when he was acquiring Vietnamese phonology, persisting to cause significant difficulties learning and differentiating his second phonological system, English. The impairment was likely to have meant that Kim took longer to develop and consolidate complete and accurate phonological representations once he began to learn English. His underlying phonological disorder remained even though the Vietnamese errors had partly resolved. Just as monolingual children with resolved phonological disorder are more likely to experience difficulties with literacy learning (Gillon & Dodd, 2005), Kim's underlying phonological deficit resulted in difficulties acquiring another phonological system.

Inconsistent errors, in the absence of childhood apraxia of speech, have been attributed to two different deficits. A phonological planning deficit (Holm et al., 2007b) might underlie IPD because it affects the ability to generate production plans that specify the sequence of consonants and vowels in words, despite intact phonological representations. Similarly, inconsistent speech errors, identified in aphasics, have been attributed to a deficit in the 'phonological assembly' of words (Franklin et al., 2002). An alternative hypothesis is that incomplete, inaccurate or unstable phonological representations, or difficulty accessing those phonological representations, leads to underspecified or degraded phonological plans for word production (Holm et al., 2007b; Macrae et al., 2014).

Kim made consistent errors in Vietnamese, so he must have acquired the ability to assemble phonological plans for consistent word production from Vietnamese phonological representations. Since this ability appears not to be language specific (Holm & Dodd, 1999a, 1999b), his difficulty producing consistent productions of English words might be attributable to incomplete, inaccurate or unstable phonological representations in his mental lexicon. Kim's limited exposure to and use of English may have contributed to his difficulty acquiring precise phonological representations: he was predominantly exposed to English only at school; his ability to talk in class was necessarily constrained

but limited his ability to learn English in an interactive way; and he preferred to speak Vietnamese to friends in the playground, and his sisters at home.

In a cross-sectional group study, Hemsley et al. (2006) found that Vietnamese- and Samoan-English 11-year-olds' lexical errors were generally logical (semantically or phonologically predictable based on the similarities/differences between the two languages) and the result of limited exposure to English. The bilingual groups more readily accepted inaccurate phonological representations for familiar vocabulary. For example, /θənomətə/ was frequently accepted as a correct representation of 'thermometer', and /arblau/ as a correct representation of 'eyebrow'. The results suggested that "bilingual children may have difficulty rejecting phonological foils due to storage of impoverished phonological representations for words" (Hemsley et al., 2006, p. 470).

The Dynamic Systems Theory (DST) account of language learning by bilinguals emphasizes dynamic interaction between language and environment. Interplay between these systems is a key consideration for Kim. His case study monitored English phonology from soon after a major change in Kim's language learning context: commencement of regular, consistent exposure to English at school. The DST argues that such change creates instability in language learning systems providing the learner with the capacity to integrate a new language into an existing conceptual system (De Bot et al., 2007). Windsor and Kohnert (2004) argued that some difficulties acquiring a second language might be attributed to less elaborate lexical representations in English. Kim's limited English exposure, combined with the cognitive demands of language and classroom learning may have overwhelmed his phonological processing capacity so that he was imprecisely storing phonological representations, resulting in under-specified or degraded phonological plans and therefore inconsistent word production.

Intervention

Intervention studies for bilingual children with speech disorders are few. Gildersleeve-Neumann and Goldstein (2014) applied a dynamic systems theory (DST) approach when they explored the cross-linguistic effects of dual-language intervention on speech development. They used a hybrid articulatory-phonological approach and selected intervention targets based on the existence of the error in both languages. The intervention was effective in both Spanish and English for both children in their study, not only for the intervention targets but also for generalisation to other aspects of the

children's speech in both languages. They interpreted these results as evidence that "targeting associations between languages results in cross-linguistic generalisation and suggest the interconnectedness of seemingly autonomous languages, an interconnectedness specified by DST" (Gildersleeve-Neumann and Goldstein, 2014, p. 38).

Ray (2002) provided minimal pair phonological contrast intervention in English to a trilingual child who also spoke Hindi and Gujarati. Ray hypothesized that the child had not differentiated the three phonological systems at the start of intervention because of evidence of a number of shared phonological processes. Treatment was effective across all three languages even though intervention was only in English.

Case studies reported in Holm and Dodd (2001) indicate that differences in cross-language generalisation may reflect the nature of the deficit in the speech processing chain:

- An articulation disorder (an impairment of phonetic planning) – intervention in English generalised successfully to Cantonese suggesting this peripheral level of the speech processing chain is not language-specific.
- A phonological error pattern – successful phonological contrast intervention targeting error patterns in English showed no generalisation to shared patterns evident in Cantonese suggesting language-specific phonological processes.
- Inconsistent speech (variable token-to-token production in the same context due to a deficit in phonological assembly) – intervention in English resulted in increased consistency and accuracy of production in both English and Punjabi suggesting that the ability to assemble a phonological plan for word production is not language-specific.

Clearly, the effect/s of intervention on the phonological systems of bilingual children requires further research. The outcome of Kim's intervention will add to the evidence base.

Core Vocabulary Therapy (CVT) is currently considered best practice for treating children with IPD (Dodd et al., 2010). The aim of therapy, therefore, was to teach Kim to assemble phonology in English: planning consistent sequences of speech sounds for a core set of words that had high functional value. Intervention in Vietnamese was considered neither appropriate nor

necessary as Kim's speech demonstrated consistent speech patterns in this language. He received three blocks of intervention in line with school terms: the first between October and December 2014 (six weeks), the next between February and March 2015 (seven weeks) and the final intervention between May and June 2015 (five weeks).

In CVT, parents generally play a key role in helping establish a core vocabulary for intervention, carrying out daily practice and providing online reinforcement (Holm et al., 2005a). Kim's parents had insufficient English to perform this role. For this reason, therapy took place at school. It involved staff Kim saw on a daily basis. The class teacher, in collaboration with the SLP, chose the 60 high-frequency words used in the intervention (see Appendix 16.1). The SLP modified service delivery to fit the therapy setting.

Kim attended therapy sessions four times each week. In the first session of each week Kim worked with the SLP and a bilingual Vietnamese-English-speaking teacher aide. During this session they reviewed targets from the previous week, with probes to monitor for generalisation of consistency to untreated words. Kim then learned best production for approximately eight new target words sound-by-sound, syllable-by-syllable. The SLP introduced each target word using a card with the written word and a picture. Key information about the word was then added to the card as needed, for example, a red spot for each syllable in the word, highlighting of difficult sound sequences, or pictures representing smaller words within the word. For example, when teaching the word 'Christmas', a picture of a boy's face was added to the word card to represent a friend in his class, 'Chris'. The SLP also discovered that Kim benefitted from seeing the word written in Vietnamese on the card. He appeared to find this script easier to read than English. Often, Kim would look to the teacher aide when he did not understand the SLP. At these times the teacher aide would translate information about sounds or sound sequences into Vietnamese, so that Kim could hear it in his first language.

The SLP session provided Kim with opportunities for target word practice at word and phrase level using a range of games and activities (e.g., board games, card games, Lego, bean bag/ball games and jumping frogs). Through this process, the SLP trained the teacher aide to perceive Kim's productions and provide feedback on accurate and inaccurate productions, with a focus on saying each word the same way every time. Imitation was avoided; instead Kim was given information about the plan so he could generate his own plan for each word (for a full description of this process see Chapter 12).

Follow-up sessions throughout the week involved Kim working with the teacher aide to provide further practice for achieving consistent production of

target words. Observation of several sessions indicated that Kim was a highly-motivated student, resulting in high volumes of drill during each session. The target of 20 correct productions for each word in a 30-minute session was always exceeded. Although the target words were all English, discussions between Kim and the teacher aide about words were in a mix of Vietnamese and English. Kim's classroom teacher was also aware of therapy targets each week, enabling reinforcement during everyday classroom interactions.

Outcome of intervention

Initially, Kim's progress in intervention was very slow. He required time and focus to achieve best productions consistently, relying heavily on the visual prompts on each word card as well as adult prompts to help form an accurate plan for each word. It was difficult for him to achieve natural-sounding prosody and, as a result, his speech sounded stilted or 'robotic' as he sequenced each sound to form the target word. Progress in consistency of production of untreated probes over time was also limited. Kim rarely engaged in general conversation with the SLP or TA in English. Over time, Kim occasionally attempted to recount an event or occasion to the SLP; however, communication breakdowns were frequent. These were often only resolved with the assistance of the teacher aide who translated the story from Vietnamese to English.

Half way through the final block of intervention, Kim initiated a conversation with the SLP while walking to his therapy session. He used short sentences but clearly told a story about his neighbour showing him a bird's nest in a tree, containing baby birds. The story required minimal requests for clarification. This marked a turning point in intervention. From this time on, it became easier to teach Kim new target words and his speech became less robotic. When Kim's speech was reassessed on the DEAP Inconsistency assessment following the final block of therapy (age 9;09 years), his inconsistency score was 32% (compared with 80% at initial assessment).

A review assessment five months following the final block of therapy confirmed maintenance and ongoing improvement in speech production (age 10;2 years). At this time, assessment on the DEAP Inconsistency Assessment showed Kim's inconsistency was 12%. The DEAP Phonology Assessment revealed a PCC of 91% (compared with 60% at initial assessment) and a PVC of 99% (compared with 86% at initial assessment). The residual phonological errors in Kim's speech included final consonant deletion of a range of sounds as well as occasional stopping and consonant cluster reduction (both error patterns evident in Kim's Vietnamese).

Effectiveness of intervention

Kim responded to a core vocabulary therapy approach targeting the consistency of his word productions in English. Intervention in Vietnamese was considered neither appropriate nor necessary as Kim's speech demonstrated consistent speech patterns in this language. At his follow-up assessment Kim's inconsistency was 12% (decreased by 68% from initial assessment) and his PCC was 91% (increased by 31%). Crosbie et al. (2005) outlined the intervention rationale: "Core vocabulary therapy does not target surface error patterns or specific sound features; it targets whole word production. Learning to say a set of high frequency, functional words consistently, targets the underlying deficit in phonological planning. Providing detailed specific information about a limited number of words and drilling the use of that information with continued systematic practise improves the ability to create a phonological plan on-line" (p. 474).

Kim received 18 weeks of therapy in comparison to other children treated with CVT. Dodd et al. (2010) indicate eight hours of intervention (16 twice-weekly 30-minute sessions) is usually adequate to achieve consistency of production. Kim received 18 once-weekly 30-minute sessions with the SLP (nine hours), a similar dose, although differently scheduled, particularly because of school holiday breaks. If Kim's inconsistent productions of words were due to imprecise phonological representations rather than difficulty accessing those representations it is possible that CVT was not the most appropriate intervention. Despite this, Kim responded positively to CVT. It is possible that, even though CVT was theoretically targeting consistent *retrieval* of phonological information from the lexicon, the teaching process involves providing information about the phonological representations themselves. Perhaps what Kim responded to was the process of laying down some accurate and complete phonological representations of English words that he was then able to retrieve consistently and accurately. In his case, the specific and highly-structured *input* aspect of CVT might have scaffolded Kim's weak phonological learning system and allowed him to develop his second phonological system more quickly and accurately than he was able to do for his first.

Summary and conclusion

This case study presents Kim's bilingual speech profile. He had a history of speech difficulty in Vietnamese that had never been treated by an SLP and

had not entirely resolved. Kim did not start learning English until he was nearly 8 years old. After a year's exposure to English, primarily at school, his speech remained largely unintelligible. Assessment indicated a high degree of inconsistency in his production of English words. Core vocabulary intervention, provided in English, effectively resolved Kim's speech difficulty.

Treatment case studies of bilingual children with different types of speech difficulties can address clinically and theoretically significant questions. Kim's case confirms that it is vital to conduct a thorough speech assessment in both of a bilingual child's languages. It also highlights the importance of obtaining a detailed case history regarding the development of both languages. This assessment data and case history information must then be thoughtfully interpreted, based on an understanding of typical bilingual phonological development and a theoretical psycholinguistic speech-processing framework, to allow differential diagnosis of articulatory and phonological disorders.

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Appendix 16.1 Kim's core vocabulary

clock	tuckshop	two	four
science	half	past	pass
six	Friday	November	Christmas
December	holiday	Miss	computer
seventeen	sister	Wednesday	drink
eight	five	Mr S	thankyou
I'm thirsty	first	star dragon	sport
hurry up	lunch time	drink please	library
grandpa	sport	I need some help	o'clock
sleep	castle	fourth	Australia
spaghetti	seven o'clock	ambulance	quiet
4V	communication book	stop it	homework

*Note: words revealing Kim's identity have been removed from the list