

Assessing and Treating Children with Speech Sound Disorders: Collaboration between Speech-language Therapists and Teachers in Malaysia

Phoon Hooi San^{1*}

¹Faculty of Social Sciences, Quest International University, Perak, Malaysia

*hooisan.phoon@qiu.edu.my

Abstract: Speech sound disorders (SSDs) are one of the most prevalent communication disorders diagnosed in the preschool and school age populations. Due to the lack of speech therapy services in the public schools in Malaysia, teachers are required to work collaboratively with speech-language therapists to ensure that children with SSDs benefit from early speech intervention. The purpose of this study is to disseminate pertinent knowledge to Malaysian teachers about the assessment and treatment of children with SSDs. The description of a real case study will highlight the speech characteristics of a child with SSD and the types of remedial activities for teachers' reference. It is hoped that Malaysian teachers would then be better able to provide information and support in the assessment and treatment process of children with SSDs. A 7 year-old Malaysian Chinese boy who was suspected of having SSD was the subject of the case study. A case study was explicated to demonstrate how a child with SSD was assessed and treated using the speech therapy approach. The study reports the assessment and treatment process in speech therapy for a child with SSD. The process included case history taking and interview, initial speech evaluation, diagnostic impression making, recommendation, and treatment. The rationale for each of the procedures was given. This paper offers insights to Malaysian teachers on the assessment and treatment processes of a child with SSD. Additionally, this paper also provides information for Malaysian teachers about how they can help to identify children with SSDs and work collaboratively with speech-language therapists to provide information during the assessment process and facilitate the speech therapy intervention in the classroom.

Keyword: speech sound disorder, assessment, treatment, speech-language therapists, teachers

INTRODUCTION

An essential part of speech and language development is the acquisition of speech sound production. To be able to talk, children need to produce the sounds and the sound combinations of their languages. Each language has a unique set of sounds associated with it, which is called the speech sound repertoire of a language. For example, the speech sound system of British English consists of 24 consonants and 23 vowels. In order to master the production of speech sounds, a child must be able to acquire two basic skills. First, the child must learn to produce a variety of sounds in his language that is appropriate for his age. Second, a child must develop a system of rules for organizing and using those sounds. Children who face problems in either of these two aspects are regarded as having speech sound disorders (SSDs). It is worth noting that SSDs occur when a child does not develop the ability to produce some or all sounds necessary for speech that is normally used at his age.

SSD is defined in DSM-5 (American Psychiatric Association, 2013) as a 'persistent difficulty with speech sound production that interferes with speech intelligibility or prevents verbal communication' that cannot be explained in terms of sensory problems, motoric difficulties, or other physical conditions. According to American Speech-Hearing-Language Association (ASHA), SSDs are used as an umbrella term for articulation disorders and phonological disorders. The nature of SSDs can be organic or functional. Organic speech sound disorders are the results of an underlying motor/neurological, structural, or sensory/perceptual cause, while functional speech sound disorders have an unknown cause. Functional speech sound disorders are related to the motor production of speech sounds as well as the linguistic aspects of speech production. Historically, these disorders are known as articulation disorders and phonological disorders respectively.

An articulation disorder refers to difficulties in producing speech sounds or certain speech sounds. It is a motoric disorder (Bernthal & Bankson, 2004), resulting from structural, physiologic, sensory, or neurologic impairments (Gordon-

Brannan & Weiss, 2007). For instance, a child may produce “I saw two tigers in the safari park” as “I taw two tigers in the tafari park”. This is a manifestation of an articulation disorder as he is unable to produce the /s/ sound consistently in words containing/s/ sound and uses [t] as a substitution. Usually, this child will also have problems producing this sound in isolation. When he is asked to say /s/ in isolation, he will also produce /t/. Alternatively, children with a phonological disorder can produce the sounds in isolation pretty well, but they cannot use the phonological rules correctly (ASHA, 2000). They face problems in organizing the speech sounds and in applying the sounds correctly in speech (Bernthal & Bankson, 2004). The errors they make would be more extensive. Given the above example, the child would probably say “I kaw two kigers in the sapari park”. The child substitutes the /s/, /t/ and /f/ sounds in words inconsistently.

LITERATURE REVIEW

Prevalence and Impacts of Speech Sound Disorders

Statistics show that SSDs are one of the most prevalent communication disorders diagnosed in the preschool and school-age populations. The prevalence of communication disorders in Australia, inclusive of difficulties with articulation, was between 12% and 13% (McLeod & McKinnon, 2007). Approximately 16% of children have SSDs at 3 years of age (Campbell, Dollaghan & Rockette, 2003) and an estimated 3.8% of children continue to present with speech delay at 6 years of age (Shriberg, Tomblin, & McSweeney, 1999).

As indicated, SSDs which occur during childhood can persist for many years after the initial diagnosis (Law, Boyle, Harris, Harkness & Nye, 2000). SSDs will persist into adulthood if they are not treated. Therefore, the residual effects of early childhood SSDs may be lifelong. Given this scenario, early identification and treatment for children with SSDs are crucial. This is because SSDs are closely related to the social and cognitive development of children. Children with SSDs are reported to be at risk for social problems and are often bullied at school (Hall, 1991; Silverman, 1992). There is also a clear relationship between speech skills and literacy outcomes (Bird, Bishop & Freeman, 1995; Catts, 1993; Gillion & Dodd, 1998; Leitão, Hogben & Fletcher, 1997; Lewis, Freebairn, & Taylor, 2002; Preston, Hull & Edwards, 2013). Tambyraja, Farquharson & Justice, 2020). According to Tambyraja, Farquharson and Justice (2020), school-age children with SSD showed an increased risk for reading difficulties that are likely to persist till the end of the school year. Preston, Hull and Edwards (2013) tested twenty-five children with histories of preschool SSDs at an average age of 4;6 and followed up at 8;3, they concluded that children who exhibited disordered speech sound errors were more likely to have weak literacy skills at a later stage. Bishop and Adam (1990) found that for children whose speech is not intelligible by age 5 years and 6 months, literacy development will most likely be compromised. More than half of the children with SSDs encounter later academic difficulties in language, reading, and spelling (Aram & Hall, 1990; Bishop & Adams, 1990; Flax, Realpe-Bonilla, Hirsch, Brzustowicz, Bartlett & Tallal, 2003; Lewis, Freebairn & Taylor, 2000) and often require other types of remedial services, with 50-70% exhibiting general academic difficulty through grade 12 (Gierut, 1998). All these difficulties have an impact on their employment opportunities during adulthood (Felsenfeld, Broen & McGue, 1994). Without intervention, many children continue to suffer the negative consequences of this disorder in school. The inability to deliver intelligible speech has a devastating impact on their self-confidence, social and communication skills, and participation in classroom activities.

Professional Involvement in Identifying and Treating Children with SSDs

A number of professionals work collaboratively to assess and treat children with SSDs. These include medical doctors, speech-language therapists and teachers. The role of medical doctors is to detect and treat organic factors (e.g. cleft lip and palate, misalignment of teeth) that are often the cause of SSDs. Speech-language therapists (SLTs) are professionals who evaluate, diagnose and treat speech, language, cognitive-communication and swallowing disorders in individuals of all ages, from infants to the elderly (ASHA, 2012). Consequently, the SLP is a key person who diagnoses and intervenes in the speech-language learning process of individuals with SSDs. Statistics in the United States show that almost 91% of SLTs who work in schools are providing therapy to children with articulation and phonological disorders (ASHA, 2006). However, it is worth noting that currently, speech therapy services are not available in the public schools in Malaysia. Therefore, children with SSDs would need to look for speech therapy services in the hospitals. Teachers are one of the most important persons who can help to identify children with SSDs and provide support in the intervention. This is because

teachers spend the major portion of their school day observing their pupils' communicative behaviours (Haynes, Moran & Pindzola, 2012). Therefore, pupils who exhibit poor speech intelligibility would be noticed by teachers. Parents reported that teachers are one of the important sources of information about their children's speech development (McAllister, McCormack, McLeod & Harrison, 2011). Referral by teachers is considered a valid means of identifying preschool and school-age children with SSDs (Bowen, 1997; Machado, 2009). Teachers play an important role in the detection of children with SSDs and subsequently in facilitating the provision of early speech therapy intervention. Due to the lack of speech therapy services in public schools, Malaysian teachers might not be aware of the role of speech-language therapists in helping children with SSDs. Therefore, there is a need to bridge the gap in Malaysian teachers' knowledge in this aspect.

Early Identification of Speech Sound Disorders

Despite the high prevalence of SSDs among preschool and school-age children, many children with SSDs have not received proper intervention due to the lack of understanding about SSDs. The lack of knowledge about SSDs affects how the teacher works with a particular child and the ways in which teachers collaborate with speech-language therapists. Primary school teachers expressed their concerns about the lack of training, information and collaboration with SLTs leading to difficulty in identifying, supporting and referring children at risk of speech and language problems (Hall, 2005). Teachers also voiced that they need more support to identify children at risk of speech, language and communication problems (Mroz, 2006). The lack of teachers' knowledge of children's speech sound development could result in failure to recognize indications of SSDs among preschool children. Hence, young children whose speech is not developing typically might not receive appropriate attention and treatment as early as needed and therefore, may continue to experience difficulty in producing speech sounds. Early intervention can benefit children with SSDs and lessen the potentially adverse educational, social and occupational outcomes of communication impairment (Law, Garrett, Nye, & Dennis, 2012). Law, Garrett and Nye (2003) found that children who underwent speech therapy improved their speech skills faster than children who did not. Given this scenario, the need to raise awareness about SSDs is necessary to ensure appropriate identification, referral and service provision for children at risk of SSDs (McAllister et al., 2011).

The purpose of this study is to disseminate pertinent knowledge to teachers about the assessment and treatment of children with SSDs. For this purpose, a real case study was used to provide an illustrative example of how a child with SSD was assessed and treated in speech therapy. The description will highlight the speech characteristics of a child with SSD and the types of remedial activities for teachers' reference. Consequently, it is hoped that teachers would be able to provide information and support in the assessment and treatment process of children with SSDs.

METHODS AND FINDINGS

Study Design and Participant

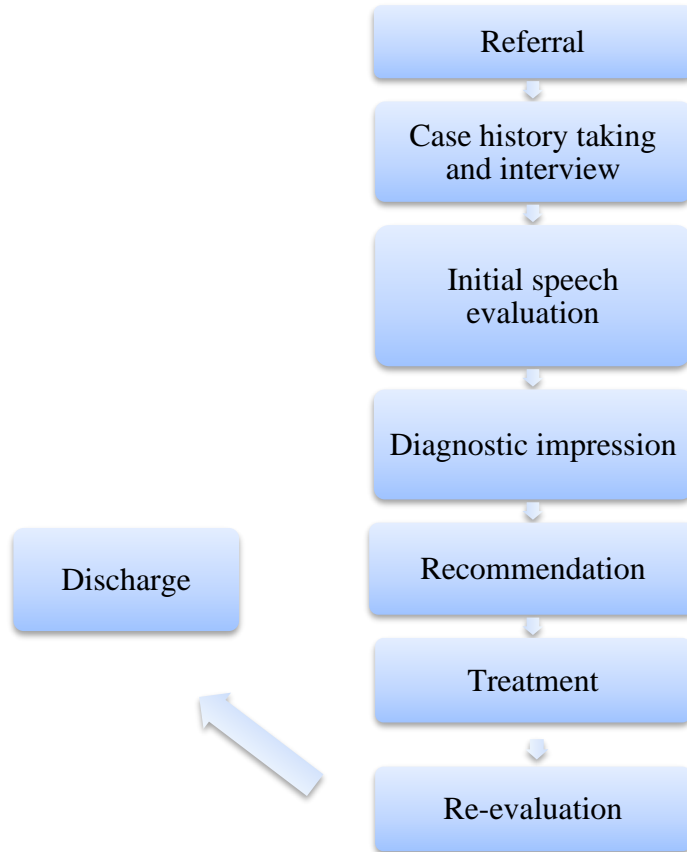
This is a case study involving a 7-year-old Malaysian Chinese boy, Peter who is currently attending Primary 1. Peter's mother brought him to the speech therapy clinic the author due to her concerns about Peter's unintelligible speech. Peter was noticed to have difficulty pronouncing some words clearly during conversation and reading activities. There was no history of a similar problem found in Peter's family. Peter uses English as the dominant language at home with his parents and elder sister. He learns Mandarin and Malay in school.

Procedures

The assessment and treatment process undergone by Peter was documented. The whole process included case history taking and interview, initial speech evaluation, diagnostic impression making, recommendation and treatment. The process is illustrated in Figure 1 and described in the following sections.

Figure 1

Assessment and Treatment Process of Children with Speech Sound Disorders

***Case history taking and interview***

Prior to an initial speech evaluation, a case history about Peter was taken. Case history taking is a starting point for understanding Peter and his communication problems. It is necessary for an SLP to anticipate those areas that will need assessment, identify topics that require further clarification and preselect appropriate evaluation materials. The case history session included gathering background information, medical history, and speech, language and hearing milestones. Peter's mother reported no suspicion of any medical, language or hearing problems, except that Peter might be having an articulation difficulty. Interviews with Peter's mother were also carried out to gather information such as difficulties that Peter encountered resulting from his speech problem.

Initial speech evaluation

After the case history taking, an initial speech evaluation was conducted. The primary purposes of the initial speech evaluation included describing their articulatory and phonological status of Peter; determining whether Peter's speech sufficiently deviates from normal expectations to warrant treatment and identifying factors that relate to the presence of the SSDs (Shiplely & McAfee, 1998).

The evaluation consisted of a number of components as follows:

- 1) First, an Oro-motor Examination (OME) was conducted to assess the physical strength and movement of the oral muscles that Peter needed for speech production. The results of the OME showed that all of Peter's articulatory structures including lips, teeth, tongue, hard palate and velum appeared to be within normal limits. Diadochokinetic rate is a means of assessing oral motor skills which provides information about an individual's ability to make rapid speech movements using different parts of one's articulators. For instance, Peter was required to say /pataka/ rapidly. Peter's Diadochokinetic abilities were inconsistently demonstrated as seen in the inaccurate production of words, characterized mainly by phonological substitution in which the /ka/ syllable was produced as [ta].
- 2) Second, articulation and phonological assessments in English were administered. English was chosen as it was the dominant and communicative language used by Peter. A picture naming task was used to elicit single-word utterances from Peter. Single-word naming is widely used among Malaysian speech-language therapists as standardized articulation and phonological assessment tools are not available (Phoon & Maclagan, 2009). Single-word picture naming has become popular among SLTs as it is simple and relatively easy to conduct; it is easier to transcribe due to a predetermined word list; it contains specifically targeted sounds in a variety of phonotactic shapes and phonetic contexts, and it can be repeated at a later date to monitor a child's progress over time (Stoel-Gammon & Dunn, 1985; Wolk & Meisler, 1998). In addition to single picture-word naming, a spontaneous speech sample was obtained through interacting with Peter in natural conversation. As spontaneously connected speech samples are the most valid or representative sample of phonological performance (Shriberg and Kwiatkowski, 1980; Stoel-Gammon and Dunn, 1985; Morrison and Shriberg, 1992), they were deemed necessary when evaluating Peter's speech status.

The findings of both assessments were analyzed based on independent analyses and relational analyses. Independent analysis refers to the child's production by itself regardless of the relationship to the adult model, while relational analysis compares the child's correct and incorrect productions of a word with the standard adult form. Independent analysis showed Peter's phonetic inventory. A phonetic inventory depicts the inventory of all speech sounds, regardless of whether or not the sounds are realized correctly relative to the language. Peter was found to produce the sounds of [p] (e.g. pie), [b] (e.g. ball), [t] (e.g. tiger), [d] (e.g. dog), [f] (e.g. five), [v] (e.g. vase), [h] (e.g. house), [m] (e.g. money), [n] (e.g. nine), [w] (e.g. watch), [j] (e.g. yoyo), [r] (e.g. red) and [l] (e.g. leg) accurately. However, the consonants that he could not produce included /k/ (e.g. kite), /g/ (e.g. goat), /s/ (e.g. sun), /tʃ/ (e.g. chair), /ʃ/ (e.g. shoe), /z/ (e.g. zoo), /dʒ/ (e.g. jam) and /ʒ/ (e.g. treasure). The relational analysis indicated that the following error patterns were remarkable: fronting (substitution of a more anterior sound for a posterior sound, e.g. cake was produced as take), stopping (substitution of a stop for a fricative or affricate, e.g. sun was produced as tun) and cluster reduction (reduction of a cluster to a singleton, e.g. blue was produced as bue). In order to describe the severity of involvement of Peter's SSDs, the Percentage of Consonants Correct (PCC) was computed. PCC was calculated based on the percentage of the total number of target consonants that were correct. Peter's PCC was 57%. Based on Shriberg and Kwiatkowski's (1982) four levels of severity of involvement based on PCC, a value of 50%-65% is considered as a moderate-severe impairment.

- 3) Third, observations were done to check Peter's voice, fluency and language in general. Although Peter's mother did not raise concerns in these aspects, it is recommended to routinely check on these aspects for confirmation purposes. The observation of language development is important as it helps to determine overall communication functioning. From the observation, all three aspects were unremarkable and appropriate for Peter's age.

Diagnostic impression and recommendation

Based on the findings of the assessments, a diagnostic impression was made. In relation to that, Peter, a 7-year and 4-month-old male, was found to demonstrate moderate-severe functional articulation and phonological disorders. Articulatory development is remarkable, resulting in poor intelligibility of speech production. His peripheral oral motor system was found to be within normal limits. In addition to this, his fluency and voice were unremarkable. His language development appeared to be age-appropriate. Recommendations were made following the diagnostic impression. Peter was recommended for a block therapy of 10 sessions over a 3-month period. Every session would last 45 minutes. Speech treatment was recommended as Peter's speech sound development was not appropriate for his age. Had Peter's speech sound development been found to be appropriate for his age, he would have been discharged from the speech therapy service.

Treatment

Once the speech therapy was recommended, the SLP determined goals and objectives for Peter's treatment as well as ways to achieve these goals and objectives. Diagnostic information derived from the assessment served as the basis for developing such goals. A number of treatment methods were used to improve the articulation of individual sounds and reduce errors in the production of sound patterns in Peter. In each therapy session, activities were designed and implemented to achieve the goals of the therapy. The treatment Peter received during the blocking therapy is described as a whole, to give an overview of the approaches that had been used. These approaches are described below:

- 1) Peter was taught to produce the targeted sound correctly by using the phonetic placement approach in the articulation treatment. In this approach, the SLP described and demonstrated the correct manner and place of articulation and the correct voice and voiceless components of the targeted sound. Therapy targets for articulation treatment for Peter were chosen based on the order of speech sound acquisition in normally developing children. In other words, therapy targets for Peter were selected in the general order as they emerge developmentally. Rvachew and Nowak (2001) agreed that the sequence of the sounds to be targeted in the therapy should begin with the easier sounds. Based on Peter's chronological age, the sounds to be targeted first were: /k/ (e.g. kite), /g/ (e.g. goat), /s/ (e.g. sun), /tʃ/ (e.g. chair), /ʃ/ (e.g. shoe), /z/ (e.g. zoo), /dʒ/ (e.g. jam) and /ʒ/ (e.g. treasure) (Sander, 1972). As an example, to teach the articulation of the /k/ sound, the correct placement of the /k/ sound was shown to Peter. Peter was required to produce the target sound /k/ in isolation following the SLP's model. The sound was first taught in isolation (e.g. /k/ sound), then followed by practising sounds in nonsense syllables (e.g. /ka/, /ki/, /ku/, /kə/), different word positions (e.g. 'cat' /kæt/ in initial word position, 'bucket' /bʌkət/ in medial word position, 'truck' /trʌk/ in final word position), phrases (e.g. 'a cat and a duck' /ə kæt ænd ə dʌk/) and sentences (e.g. 'I cut the cake' /aɪ kʌt ðə keɪk/). The drill play method was used in which a game was incorporated into the practice. Peter practised the targeted speech sounds and then he was given an opportunity to play a game. Examples of the games included board games, lotto and memory games.
- 2) In addition to this, the speech perception approach was used to teach Peter to discriminate between correct and incorrect sounds. Peter was required to listen to a number of words which contained both correct and incorrect productions and pick out the correct production and reject the incorrect production. For example, Peter listened to recordings of the word 'car' and picked up the ones that sounded like 'car' and rejected the ones that sounded like 'tar'.
- 3) Next, the phonological approach involved teaching the rules of speech to Peter to help him say words correctly. For instance, Peter was presented with 'minimal pairs' of words, which are two words that differ in pronunciation by only one feature that ultimately changes the meaning of that word. For example, to eliminate front, one of the minimal pairs presented in therapy could be 'key' and 'tea'. Peter must first learn to hear the difference between the two words, and then learn to say them. The sequence of the error patterns to be targeted were fronting, stopping and cluster reduction as indicated in the norms reported by Stoel-Gammon and Dunn (1985). The norms indicated the sequence in which error patterns are first suppressed by normally developing children.
- 4) After each session, Peter was given a structured home programme to consolidate the goals in the therapy session. The home programme was written in a *speech notebook*. A speech notebook was used to record the speech goals, activities or assignments, exercises and comments of speech therapy sessions. Parents and teachers were encouraged to check the speech notebook to find out what the child was doing in the speech therapy and how they

could assist in the remediation program. After the 10 sessions of block therapy, a speech evaluation was carried out on Peter to monitor changes in articulatory and phonological abilities and performance across time. The results of the evaluation will normally be one of the following scenarios: Peter being put in another block therapy if his condition persists or; Peter is dismissed from speech therapy because he no longer has an articulation/phonological disorder, or he continues to have an articulation/phonological disorder, but it no longer affects his academic or social or performance; or he has plateaued in his progress; or he is not motivated to continue working on the disorder (ASHA, 2003, p.31).

DISCUSSION

Speech therapy practice is based on the principles of the scientific method that follows a systematic progression. It is essential that Malaysian teachers understand the procedures involved in the assessment and treatment process and the objectives of the procedures. By knowing the rationale of the assessment and treatment for a child with SSDs, teachers would be able to have a comprehensive picture of how a child with SSDs is assessed and treated by an SLP when the child is referred to a speech therapy service. It is hoped that this case study has sufficiently illustrated the speech characteristics of a child with SSDs. This serves as an example that can help teachers to understand the speech characteristics of children who are at risk of SSDs in their classrooms. If teachers are able to identify children who show symptoms of SSDs, this will increase the opportunity for early intervention, which, in turn, prevents or reduces subsequent problems of academic and social performance related to speech sound difficulties. In order to know whether a child is developing his speech sound normally, teachers may refer to the speech milestones chart that was developed for the local children in their country. If the child is unable to produce certain sounds at a particular age as stated in the speech milestones chart, then teachers can refer them to SLTs for advice.

Teachers play an important role as a source of diagnostic information as well as in assisting in treatment approaches. Teachers can assist SLTs by providing relevant information about children with SSDs and also helping to facilitate speech therapy goals in the classroom. Teachers can provide information during the assessment by informing the SLP about the child's communicative abilities in school. These should include 1) what sounds or words the child seems to have difficulty with; 2) whether the child ever produces any of the erroneous sounds correctly; 3) whether the teachers and other students have difficulty in understanding the child; 4) how other students react to the child's speech problem, and 5) whether the child talks as much as his peers in class.

As for the treatment approaches, teachers need to know how to help in achieving the speech goals. Teachers can inform the SLP of the topic, objectives and materials used in the classroom, so that speech activities could be designed to accommodate the teacher's lesson plan. This ensures the relevance of the speech activities, as well as enables both classroom activities and speech activities to reinforce each other (Haynes et al., 2012; Weiss, Gordon & Lillywhite, 1987). For instance, if the topic of classroom teaching is about food, then SLP may design the speech therapy activities based on the topic which is parallel with the speech goals. Using Peter's case as an example, the SLP could use food as a theme in the therapy and work on the names of food that contain the /k/ sound. For example, ketchup, chicken, cake, curry, cookies and corn. The minimal pairs that the SLP can use include cake/take and corn/torn. In addition to this, teachers can help to monitor the child's speech during classroom activities (Weiss et al., 1987). For instance, teachers can refer to the speech notebook to understand the speech goals that the child is currently working on and what the child should and should not be able to do. However, teachers should be requested to perform only activities that do not demand much time and that are compatible with normal classroom activities. For instance, if the child is working on producing /k/ in the initial word position (e.g. cat, cow, kite, king), teachers may pay attention to words containing /k/ in the initial word position when the child participates in reading aloud in the classroom and intermittently reinforce correct sound productions. The teacher may use the speech notebook to report to the SLP about the child's performance such as whether the sound is being used correctly in more words. Then, the SLP will know how well newly learned speech sounds are generalizing to the classroom setting.

There are a number of limitations in this study. The case study reported here was based on a model of speech therapy service delivered in Malaysia. Currently, there are no SLTs attached to the regular schools to deliver speech therapy services. Most of the children who are at risk of speech and language problems are referred to SLTs working in hospitals or clinics.

Therefore, the service delivery reported here may be different from some countries, such as the United States, where a speech therapy service is available in regular schools. However, the model of speech therapy delivery mentioned here would be applicable to countries where a similar practice is used. In addition to this, there are currently no standardized articulation and phonological assessments that are designed for Malaysian children. Therefore, SLTs in Malaysia use informal assessments to assess the speech status of the children. Picture naming and conversation are commonly used by Malaysian SLTs to assess the phonological performance of their clients (Phoon & Maclagan, 2009). It is worth noting that formal assessments are commonly conducted in countries where standardized assessment tools are easily accessible, for instance, the United States and the United Kingdom.

In addition to this, it is pertinent to highlight that children with SSDs are all different, and the underlying reason for the speech problem may vary from child to child. In the present study, a case study of a child with functional articulation and phonological disorders was presented. Children with SSDs may respond differently to speech therapy practices and the number of speech therapy sessions needed for the individual child may differ. A number of studies have proposed that approximately 20 hours of speech therapy across 15 weeks are necessary before the child's speech will become intelligible (Jacoby, Levin, Lee, Creaghead & Kummer, 2002; Schooling, 2003). Nonetheless, for complex cases, as many as 100 hours of intervention may be needed (Campbell, 1999). Therefore, the findings reported in this case study should be interpreted with caution and should not be overgeneralized.

CONCLUSION

This paper offers insights to teachers on the assessment and treatment processes of a child with SSDs. In addition to this, this paper also provides information for Malaysian teachers about how they can help to identify children with SSDs and work collaboratively with SLTs to provide information during the assessment process and facilitate the speech therapy intervention in the classroom.

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