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### Introduction

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It has been more than ten years since the last issue of Child Assessment Service Epidemiology and Research Bulletin (CASER) on this topic. The term “specific language impairment” has been used to refer to a significant impairment in spoken language ability when there is no obvious accompanying condition, such as mental retardation, neurological damage, or hearing impairment. Different terminologies such as language delay, specific language impairment, and developmental language disorder (DLD) have been used locally and overseas by speech therapists and other professionals.

Recently, the term DLD was proposed<sup>1,2</sup> for language difficulties that are not associated with a known biomedical condition. Locally, a special interest group on Terminology for Child Language Disorders (TCLD) comprising speech therapists in clinical and academic sectors, was formed with the aim of arriving at a consensus on a diagnostic framework and the diagnostic terminologies to describe language disorders in children. Our speech therapist will provide a summary of the discussion. The Child Assessment Service (CAS) will adopt their suggestion to use the term “developmental language disorder” to replace specific language impairment.

While inadequate language input is not considered to be a cause of DLD by most investigators, it is believed that language input can be modified to facilitate growth in language ability. In this issue, our speech therapist will

discuss how prolonged screen time affects the language development of children. Finally, it is widely reported that children with DLD have difficulties in social and educational performance due to persistent language difficulties and other comorbidities. Our team will discuss common comorbid conditions and present a local study on the relationship between language abilities and theory of mind (ToM) performance.

### References

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### Epidemiological Data of Developmental Language Disorder at the Child Assessment Service from 2011–2020

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In this study, we included all cases registered in CAS with the diagnosis of language disorder made at or older than 4 years old during the period 1 Jan 2011 to 31 Dec 2020. Cases with intellectual disability, significant hearing loss, autism spectrum disorder, or cerebral palsy were excluded. This group of children matched the diagnostic criteria of developmental language disorder (DLD).

There was a rising trend from 2011–2020, which coincided with the rise in number of referrals and the proportion of children who were 4 years old and over. Possible reasons may be an increase in the awareness of language and learning problem of preschool teachers who made referrals through maternity and childcare centres, compounded by the increase in the availability of preschool rehabilitation services. From 2020 data, interestingly, there was a high percentage of cases referred for behavioural problem, followed by developmental delay, language problem, and learning problem. The reasons may be that poor language ability affects children’s social communication and learning. Another reason is that DLD is commonly associated with poor attention and literacy problem. It could be reflected from the statistics that 22% of cases exhibited symptoms of attention deficit and hyperactivity disorder (ADHD), and 27% of cases had been diagnosed with dyslexia or were at risk for dyslexia.

From the results, we recommend that clinicians should rule out developmental language disorder for cases presented with learning and behavioural problems.

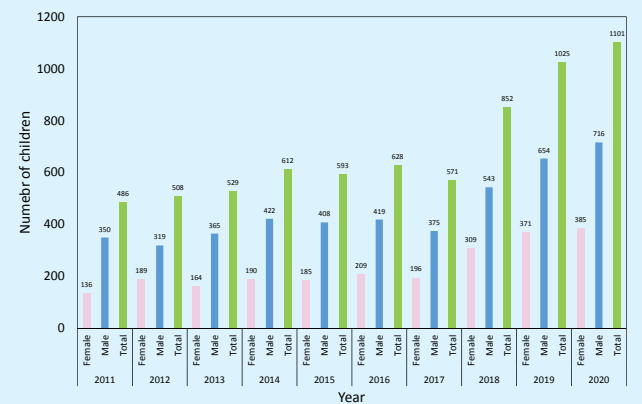


Figure 1. Number of DLD children above 4 years at diagnosis in CAS from 2011 to 2020

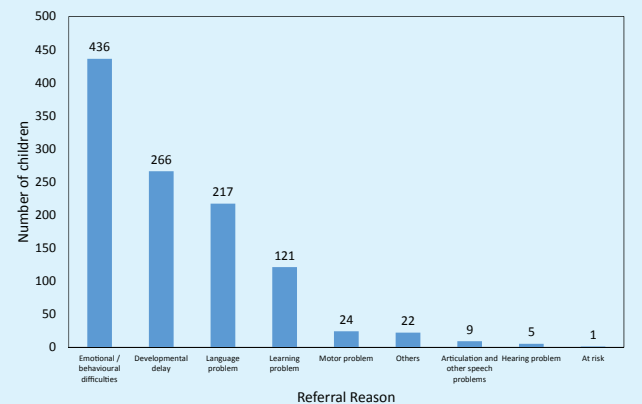


Figure 2. Number of DLD children by referral reason, 2020

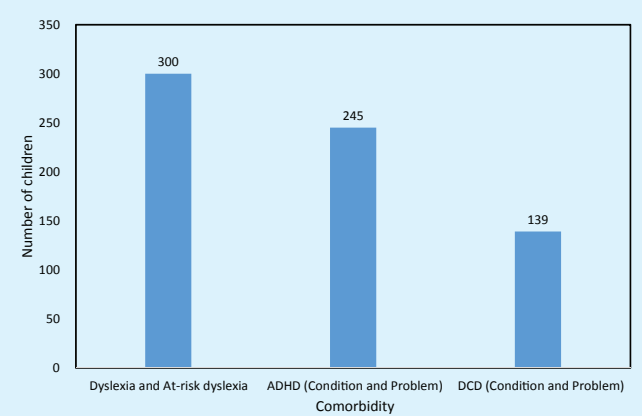


Figure 3. Number of DLD children by comorbidity, 2020

## Developmental Language Disorder (DLD) and its Comorbidities

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Language disorders in childhood have long been documented and studied globally, and there have been a vast variety of terms and labels coined over the past two centuries.<sup>1-4</sup> Previous research suggested that its prevalence was approximately 7% in English-speaking countries.<sup>5</sup> In order to address the discrepancies in terminology and streamline the definition of language disorders, the CATALISE group suggested adopting the universal term “Developmental Language Disorder” (DLD) as a language problem that persists and is associated with significant social or educational functioning impairment.<sup>6</sup> DLD refers to language problems that are enduring and relatively unresponsive to general educational inputs, with no association with a known medical condition. Further, the prognosis is perceived to be poor as it endures in middle childhood and beyond.

As the advocacy for using DLD progressed around the globe, Hong Kong has also started to explore, discuss, and seek agreement about the term used to describe children with language problems, particularly in recent years. Speech therapists at the Child Assessment Service (CAS), Department of Health, are some of the pioneers of this movement. Mr Ashley Ng, our speech therapist, provided a local perspective on working towards a common diagnostic framework to describe

children in the previous article in this publication (see article by Mr Ng on this issue). It is believed that by having a consistent and reliable label, different parties, such as therapists, teachers, and parents, would understand the problem better and provide children with early intervention and targeted treatment. More importantly, the criteria of DLD apply to and expand the possibility of investigating other co-occurring neurodevelopmental conditions with persistent language problems.

Studies found that language problems are frequently seen in children with autism spectrum disorder (ASD),<sup>7</sup> attention deficit/ hyperactivity disorder (ADHD),<sup>8,9</sup> dyslexia,<sup>10,11</sup> developmental coordination disorder (DCD),<sup>12,13</sup> as well as social, behavioural, and emotional problems.<sup>14,15</sup> In order to provide immediate, suitable, and appropriate services to children and their families, accurate and early identification of DLD with other neurodevelopmental conditions in medical, educational, and research settings is crucial. As a result, this article reviews up-to-date studies about comorbidities of DLD (for instance, dyslexia, ADHD, and motor and other emotional problems). It also aims to provide further insights into child assessment and treatment paradigms in Hong Kong.

## **DLD and Dyslexia**

Dyslexia is one of the most common neurodevelopmental disorders, affecting around 3 to 7% of the population in English-speaking countries<sup>16</sup> and around 9.7% to 12.6% among Cantonese-speaking children in Hong Kong.<sup>17</sup> It is defined as a specific learning disorder with associated difficulties in word recognition, accuracy, fluency, poor spelling, or decoding abilities.<sup>18</sup> Phonological processing was predominantly documented over the past decade as one of the major underlying deficits associated with dyslexia.<sup>19</sup> Not only are phonological skills the foundation for learning how to read alphabetic languages, but research also found that dyslexia in logographic languages, namely Chinese, is also related to phonological deficits (memory, awareness, and retrieval), although it appears to be less common than alphabetic languages, such as English.<sup>20</sup>

Looking back at literature examining dyslexia, Orton first

proposed dyslexia as a language-based disorder, with an observation that many poor readers had a history of oral language problems.<sup>21</sup> There has been a growing body of evidence supporting the notion that dyslexia is based primarily on deficits in the phonological component of language.<sup>22,23</sup> Meanwhile, there is also numerous research showing that problems in phonological processing are common in children with DLD.<sup>24,25</sup> In view of the strong links with phonological deficits in both dyslexia and DLD, some scholars suggested that dyslexia and DLD might be different manifestations of the same deficit according to their severity.<sup>26,27</sup> It means that children with a more severe phonological deficit would probably suffer from both DLD and dyslexia. For those with a milder deficit, they would be diagnosed with dyslexia as well as some or none of the DLD symptoms. Bishop and Snowling later revisited the relationship between DLD and dyslexia, taking into consideration the crucial influence of non-phonological components of language in literacy development.<sup>10</sup> This argument could be, in fact, traced from earlier studies.<sup>28</sup> Some deficits, namely semantic and syntactic, were found to be related to DLD, as well as reading comprehension difficulty. Thus, children with DLD would probably be comorbid with dyslexia; and children with dyslexia might be free from any symptoms of DLD.

Further studies by Catts et al proposed DLD and dyslexia as distinct neurodevelopmental disorders that frequently co-occur.<sup>29</sup> The result suggested that 17 to 36% of children with DLD in kindergarten through to eighth grade also met the diagnostic criteria for dyslexia. This hypothesis has later been supported by a variety of research over the past years.<sup>30,31</sup> Although there is some overlap in the respective subclinical difficulties between DLD and dyslexia, there is a large sum of children who only met the diagnostic criteria of one of the disorders. These children are found to have rather normal performance in the abilities associated with the other disorder. Furthermore, children who do not possess a significant deficit in phonological processing could meet the criteria for DLD.

This is consistent with the definition used, that DLD is a condition with or without deficits in phonological processing.<sup>3</sup> At the same time, children with DLD without dyslexic characteristics demonstrate similar aspects and severity in non-phonological deficits in vocabulary, semantic, morphological processing, and syntax when compared with children with both DLD and dyslexia. Results also revealed that, regardless of the presence or absence of DLD, children with dyslexia perform poorly in tasks targeting their phonological processing. More importantly, some of the children with adequate word recognition ability were found to have poor reading comprehension during school years. A portion of these who had poor comprehension was, in fact, found to have a history of oral language deficit.<sup>32</sup>

A recent study further investigates the different effects on reading comprehension in children with DLD and dyslexia.<sup>33</sup> It showed that children with dyslexia only, DLD only, and comorbidity between these two disorders might display reading comprehension difficulty. As predicted by previous models of reading comprehension,<sup>28</sup> the difficulty itself could be a combination of both decoding and language comprehension deficits or either of them. Results suggest that children with both disorders have the most significant difficulty in reading comprehension, followed by children with DLD, then those with dyslexia. It provides further evidence that DLD and dyslexia are two distinct disorders which share similar clinical presentations in certain aspects.

In 2016, Snowling and Melby-Lervåg conducted a meta-analysis about children at family risk of dyslexia.<sup>34</sup> It is consistent across studies that these children experience early difficulties in learning language as young as infant and toddler stages. Early symptoms of dyslexia are evident from preschool onwards. Pre-schoolers demonstrate significant difficulties in phonological awareness and decoding skills. The outcome of longitudinal studies showed that children at family risk of dyslexia, who meet the diagnostic criteria of dyslexia, displayed more severe language impairments than those who do not.

that the incidence of dyslexia in children with preschool language impairment was around 33%.<sup>11</sup> This rate is comparable to the reported rate in the research mentioned earlier in this article.<sup>29</sup> Findings also suggested that dyslexia and DLD display different developmental pathways. More specifically, a specific deficit in phonological aspects of language, namely non-word repetition, is noted in preschool children with dyslexia, while no difficulty in broader language domains is found, with the exception of children comorbid with DLD. Poor language domains, including vocabulary and grammar deficits, are associated with weak phonological processing in the group of DLD children in preschool. With time, children with only DLD display a decreasing trend of phonological difficulties. One possibility is that the gradual improvement in phonological processing of children with DLD becomes their protective factor in developing dyslexia at a later stage in life.

Research has also shown that poor literacy outcome is closely associated with the severity and pervasive language impairment in the preschool period.<sup>35</sup> This group of language impairment was considered as a persisting type, which had poor literacy outcomes. Another group was those whose language impairments were resolved around the time of reading instructions. They usually have a better outcome in literacy and language, with a relatively better performance in nonverbal ability and vocabulary. Some children, however, were identified to have relatively late emerging problems in language in middle childhood, in which many of them were at higher family risk of dyslexia. Literacy, as well as language outcomes, were just as weak as those with persisting language impairment. Putting together the evidence, a family risk of dyslexia predicts poor language performance. Resolving language impairment had limited adverse effects on the language and literacy outcomes of the children. However, when language difficulty persists, which might meet the criteria of DLD, its relationship with dyslexia becomes obvious.

Among the Hong Kong population, Chinese is the most



commonly used language. Unlike the alphabetic writing systems that are mapping to phonemic sequences, Chinese characters are made up of strokes and word parts, namely radicals, which are corresponded to morphosyllabic orthography. Nevertheless, the comorbidity between DLD and dyslexia is also common in Chinese.<sup>37</sup> The prevalence rate of dyslexia in children with DLD was about four times that in community samples.<sup>17</sup> Previous studies reported that the most prevalent cognitive deficits for dyslexia in Chinese are rapid automatised naming (RAN: 50%), orthographic skills (39%), phonological awareness (20%), and phonological memory (14%).<sup>20,38</sup>

Further investigations on the cognitive deficits among Cantonese-Chinese children with DLD and dyslexia suggested that they exhibited different cognitive deficits.<sup>36</sup> In other words, children with DLD are associated with impairments in phonological memory and morphological awareness, while children with dyslexia are found to be weak in orthographic skills and rapid automatised naming. Considering only the evidence of phonological awareness, the differences between DLD and dyslexia are not significant as they both perform worse on rhyme detection than the control group of normally developing children. More studies on Chinese children with dyslexia would be needed to understand more about the role of phonological awareness so as to compare it with the mechanisms in relatively well-researched alphabetical systems. Further, by clarifying the underlying phonological and non-phonological processing, the link as well as the comorbidity between DLD and dyslexia would provide more insight into different effective treatment paradigms targeting their specific cognitive deficits.

### **DLD and Attention Deficit Hyperactivity Disorder**

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder with onset during

childhood. It is characterised by persistent patterns of symptoms of inattention and hyperactivity-impulsivity causing significant interference with the functioning and development of children, according to the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-5).<sup>39</sup> Early studies in the 1970s to 1990s with children having language disorders from clinical and community samples have shown that children with DLD tended to have a higher rate of ADHD, or ADD (that is, ADHD with a predominantly presentation of inattention symptoms) than their neurotypical counterparts.<sup>40-47</sup>

Cantwell and Baker<sup>44</sup> and Cantwell et al<sup>45</sup> reported studies using samples of children aged 2 to 13 (mean age of 5 and 6) with speech and language impairment receiving service from a speech and hearing clinic, as well as a control group of typically developed children (that is, N=100 in the study of Cantwell and Baker<sup>42</sup> and 200 children in the study reported by Cantwell et al<sup>45</sup>). Both studies found that children with speech and language difficulties were at a higher risk of being diagnosed with ADHD and other psychiatric disorders based on the results of parent report measures (that is, 53% of children with DLD had comorbidities of ADHD or ADD). However, the findings from Cantwell and Baker<sup>44</sup> and Cantwell et al<sup>45</sup> were observed to have a major weakness in the generalisability of their findings due to the use of convenient samples from a specific organisation of clinical service. Nevertheless, the work from Cantwell et al facilitated later research from various researchers using more representative community samples.

Beitchman et al<sup>40,42</sup> reported studies using representative community samples consisting of 5-year-old kindergarten children in Canada. Randomised samples of children with DLD were identified and control groups of matched age and sex were also included. Parental and teacher reports on emotional and behavioural disorders were obtained from standardised behaviour checklists. A further psychiatric evaluation was arranged for children who met the cut-off for ADHD. In the study in 1986 reported by Beitchman et al<sup>40</sup> with a clinical sample of

142 children, 48.7% of children with DLD were found to have a diagnosis of ADD or ADHD.

For the study reported by Beitchman et al in 1990,<sup>42</sup> a large sample of 1,655 children was used to study the effects of sex differences in children with DLD and ADHD. It was found that a significant sex difference was observed in the rate of comorbidities, that is, 34% for boys and 37.5% for girls.<sup>42</sup> The results of these two studies generally indicated that children with speech or language impairments were more likely than the control group to suffer from behaviour disturbance and ADD. In addition, girls suffering from DLD had a higher risk than boys.

A similar relationship between DLD and ADHD was also found in recent studies using community samples from different countries. Sciberras et al<sup>48</sup> used a community sample of children aged 6 to 8 years drawn from integrated schools in Melbourne, Australia (N=179). They found a relatively high rate of comorbidities of ADHD and language disorders, that is, 40% of children with ADHD also had DLD, 40% of whom were boys and 42% were girls. Helland et al<sup>49</sup> reported a similar study in 2016 using a representative (N=5,672) community sample of children aged 7 to 9 from Norway. Screening questionnaires were used to identify children with three clinical conditions (DLD, reading disorder, and ADHD). They also found a high comorbidity rate of language impairment for the groups of children with ADHD (>40%), especially for the group of children who suffered from both ADHD and reading disorder. Similar findings of high comorbidity rate for language disorders and ADHD were also reported in more recent studies using clinical samples of ADHD, which fell to around 50%.<sup>50,51</sup>

Some researchers are interested in the co-occurrence of ADHD and attention difficulties in children with DLD in different stages of development and severity level. Snowling et al<sup>46</sup> reported an interesting longitudinal study in 2006 with a sample of 71 adolescents aged 15 to 16 with a preschool history of speech and language impairment at age 5. They found that subjects with more

severe and persistent language difficulties in their school age were at a higher risk of psychiatric comorbidity, specifically in attention and social difficulties.<sup>46</sup>

However, a different facet of findings was revealed by Redmond in a series of review papers in 2016 and 2020.<sup>52,53</sup> In a paper published in 2016, Redmond<sup>52</sup> reviewed literature on DLD (including those previously defined as “language impairment” and “specific language impairment” [SLI]) and ADHD using both clinical and community samples. It was found that the co-occurrence rates of DLD and ADHD were remarkably unstable and almost evenly distributed within the possible range of value as in the general population.<sup>52</sup> Redmond therefore concluded that such a phenomenon did not offer adequate support for a strong relationship between DLD and ADHD.

As pointed out by Redmond,<sup>52,53</sup> such inconsistent evidence may relate to a result of methodological factors, such as inconsistent research criteria used to define DLD, limitation on controlling possible confounding variables (for example, IQ and social background), as well as issues on using behaviour checklists from informants for ADHD. Therefore, Redmond conducted a study in 2020<sup>53</sup> with 85 children using the DSM-5 criteria for DLD and classified the subjects according to subcategories (that is, idiopathic in nature versus pragmatic in nature). Moreover, clinical measures from standardised tests and informant reports using behaviour checklists were applied. Results of this study suggested that the co-occurrence rates between DLD and ADHD varied as a function of the designation adopted when classifying children with DLD. In addition, the presence of pragmatic symptoms, but not low nonverbal abilities, showed a strong influence on observed co-occurrence rates.<sup>53</sup> Thus, the DSM-5 taxonomy and the framework of DLD seemed to provide an alternative and promising perspective when examining the relationship between DLD and ADHD.

## **DLD, Motor Difficulties, and Developmental Coordination Disorder**

Developmental coordination disorder (DCD) is a childhood neurodevelopmental disorder affecting the acquisition and execution of motor skills that is not better explained by intellectual disability, visual impairment, or neurological conditions affecting motor movement according to DSM-5.<sup>39</sup> This disorder appears to be a distinguishable disorder from DLD with its distinctive characteristics. However, studies from different countries suggested some relationship between DLD and DCD.<sup>54-59</sup>

Previous studies in the 1990s generally showed that children suffering from speech and language disorders tended to perform poorly in many aspects of motor performance, such as eye-hand coordination skills,<sup>54,55</sup> as well as ball skills and balancing.<sup>59</sup> Meanwhile, the percentage of DLD children comorbid with DCD varied widely from 20 to 71% (see literature review from Cheng et al in 2009).<sup>56</sup>

Archibald and Alloway<sup>60</sup> studied two groups of children who were diagnosed with SLI and DCD respectively (N=11 for each group) with a matched control group of typically developed children in the United Kingdom. All subjects completed standardised and non-standardised assessments on different aspects of speech and language abilities, for example, vocabulary, grammatical skills, story retelling, non-word repetition, and articulation rate. It was found that a remarkable proportion of children with DCD, with a total of 45%, showed similar performance on certain measures to the SLI group. Although children with DCD had better expressive grammatical skills, both groups of children with DLD and DCD were observed to have impairment in non-word repetition, sentence recall, and story retelling. The authors thus concluded that DLD is a common co-occurring condition in children with DCD, owing to the shared nature of impairments.

Gaines and Missiuna<sup>57</sup> reported a study using a

convenient clinical sample of Canadian preschool children aged 5 to 6 with speech and language difficulties (N=40) participating in a treatment programme on speech and language problems. They found that 18 out of 40 children (37.5%) suffered from significant motor impairment, and 12 children (30%) with DLD met the diagnostic criteria of DCD. Visscher et al<sup>61</sup> reported a study with 125 children with DLD aged 6 to 9 from special schools in the Netherlands. These children were assessed with standardised motor tests. The results of this study suggested that children with DLD are frequently associated with motor problems. Children with DLD showed deficits in manual dexterity, ball skills, statics, and dynamic balance. In addition, ball skills appeared to be the most distinctive aspect of motor impairment for DLD children.<sup>61</sup> However, most studies mentioned above tended to focus on clinical samples of school-age children with a comparatively small sample size. Relatively little was known about the relationship between DLD and DCD in preschool children, especially concerning children in Asian countries.

Cheng et al<sup>56</sup> reported a study in 2009 with a community sample of Chinese preschool children (aged 5 to 6) in Taiwan. A total number of 33 preschool children with no neurological, musculoskeletal, or intellectual disability were recruited for the study. All subjects were assessed for DLD and DCD with standardised testing. Results showed that 22 children (6.1%) had DLD, 45 children (12.4%) had DCD, and 6 children (1.65%) had comorbid DLD and DCD. In addition, children with DCD had a higher rate of DLD than those without DCD. Finally, problems with manual dexterity seemed to be an important aspect shared by preschool children with comorbid DLD and DCD. The researchers emphasised that DCD should be one of the important screening items in preschool children with DLD.<sup>56</sup>

Lachambre et al<sup>58</sup> conducted a systematic literature review in 2021 looking into the relationships between neuropsychological functions in DCD and comorbid disorders, including DLD. After a systematic review of

41 studies, the researchers identified the impairment of certain neuropsychological functions specific to DCD. They pointed out that a few studies included in the review had shown that DCD children showed similar levels of difficulty in measures of verbal working memory when compared to children with DLD and ADHD.<sup>62</sup> This result suggested the possibility of shared difficulty in a specific neuropsychological function that may be worth further research.

### **DLD and Emotional Disorders**

There is substantial evidence<sup>40-43,46,63-65</sup> from research that individuals suffering from DLD are more at risk of internalising problems (a common and general term referring to emotional problems and related disorders).

In a series of longitudinal studies starting from the 1990s, Beitchman et al<sup>40-43</sup> studied a group of children with a diagnosis of language impairment at the age of 5 and subsequently followed up to assess their emotional and behavioural problems at ages 12 and 19 respectively. Results showed that these children with language impairment at age 5 were more likely to have mental disorders at the age of 12 than typically developed children. At the age of 19, these adults were found to have a higher rate of anxiety, especially social phobia, than those belonging to a typically developed comparison sample.<sup>40-43</sup>

A literature review by Benner et al on clinical studies with cases of language impairment showed that concurrent comorbidity rates could range from 50 to 70%.<sup>63</sup> In another literature review of children with language impairment, Yew and O'Kearney<sup>65</sup> conducted a systematic review and a meta-analysis of 19 prospective cohort studies on children with DLD. They concluded that children with DLD are around twice as likely as their normal developed counterparts to develop clinical levels of emotional problems.<sup>65</sup> However, there are studies reporting no higher risk of mood disorders in samples of individuals with DLD.

Snowling et al<sup>46</sup> reported a study in 2006 with 71 youths

aged 15 to 16 with a matched control group. They found no statistical difference between the two groups on the occurrence rate of anxiety disorders (that is, social anxiety, simple phobia, separation anxiety, panic disorder and generalised anxiety).<sup>46</sup> Clegg et al<sup>64</sup> studied a group of 17 mid-thirties males with a childhood history of DLD and compared them with a normal developed sibling group and a matched control group on variables such as IQ and social class. Their results showed no higher rate of self-reported emotional problems among the groups. However, the adults with a history of childhood language disorders tended to show significantly worse social adaptation.<sup>64</sup> The inconsistency of research findings with subjects of different ages and stages of development led to the speculation that the relationship between language disorders and internalising problems may be complex in nature and mediated by certain factors, such as gender and familial factors.

Helland et al<sup>66</sup> reported an interesting study in 2018 using a population-based cohort (that is, the MoBa, a prospective population-based mother, father, and child cohort study conducted by the Norwegian Institute of Public Health) with a representative sample of 76,432 children (49.2% girls and 50.8% boys). The data of parental report on language difficulties and internalising problems using standardised questionnaires of these children were subsequently collected and analysed at 18 months, 3 years, 5 years, and 8 years old. A general language measure was used at the age of 18 months, and specific measures on different aspects of language difficulties were used for subsequent ages (that is, expressive, receptive, and semantic language difficulties). Helland et al hypothesised that early internalising of problems may predict later language difficulties and that the association is bidirectional in nature. In addition, they speculated that different types of speech and language difficulties might have a different degree of relationships with internalising problems in different stages of development in these children. Finally, they believed that gender difference may exist in this relationship due to its different social



expectations and social development.

The results of this study were interesting and inspiring, as different patterns of the bidirectional relationship between boys and girls were observed. For girls at the age of 18 months to 5 years, the degree of language difficulties was a significant predictor for change in internalising problems. The degree of internalising problems, in turn, was a predictor of change in language difficulties at all measure points. Moreover, a strong association between internalising problems at age 5 and change in semantic language difficulties was found only for girls. For boys, only the internalising problems at age 3 predicted a change in language difficulties from 3 to 5 years old.

Boys were observed to have a peak vulnerability for developing internalising problems in late preschool years. However, a statistically significant relationship was found between the nature of language difficulties, that is, receptive language difficulties and internalising problems for boys and girls between the ages of 5 and 8. Girls were also observed to have a stronger association than boys on the relationship between semantic language difficulties and expressive language difficulties with internalising problems. The findings of Helland et al<sup>66</sup> pointed out the importance of gender difference and the mechanism between functioning and the potential impact of specific variables on language difficulties.

Despite the valuable evidence accumulated from research across various Western countries, little was known about the research findings regarding children from Chinese culture. Lee et al<sup>50</sup> reported a pioneer study in 2020 using a population-based electronic patient database in Taiwan. A total number of more than 4,300 children (aged below 18) with DLD were identified from the database for further analysis. This group of children was matched with a similar sample size of same-age children without DLD. Information on the clinical diagnosis (on language disorders and affective disorders), clinical services attended, and social background were included for analysis.

It was found that children with DLD had a significantly higher risk of developing anxiety disorders and depressive disorders later in life when compared to the control group. Both boys and girls with DLD had similar risks of developing anxiety and depressive disorders. Finally, older children (those aged 8 to 18) had a significantly higher risk of anxiety and depressive disorders, but children aged 6 to 7 years had a higher risk of developing depression. Lee et al<sup>50</sup> speculated that such findings were related to the effects of DLD, which posed significant challenges to their educational transitions and their ability to meet academic requirements. Older children in school age were more likely to be identified by schools and parents for referral and intervention to support them with their emotional difficulties.

Recently, there are studies focusing on factors contributing to the emotional difficulties of children with DLD. Löytömäki et al<sup>62</sup> reported a study that compared groups of children aged 6 to 10 with DLD, ADHD, and ASD to a group of typically-developing children on emotional recognition skills. All clinical groups had no significant difference in their linguistic or cognitive skills. All children were tested on their ability to differentiate emotional cues from written materials, photographs, video clips, and a task requiring matching facial expressions and tone of voice. It was found that all clinical groups scored significantly lower than the control group, though no significant difference was observed among the clinical groups. However, children with ADHD were found to be better than children with DLD in recognising facial expressions in photographs.<sup>62</sup> Such findings revealed that children with DLD, ADHD, and ASD showed a significant delay in their development of emotional recognition skills, though further research is needed to explore factors contributing to this on emotional recognition.

Samson et al<sup>67</sup> reported a longitudinal study in 2020 which tried to identify protective factors for internalising problems (that is, somatic complaints and social anxiety) in DLD (N=104) and non-DLD (N=183) Dutch children

aged between 9 to 16. All children were asked to perform self-reported measures on emotional awareness and happiness twice at an interval of 9 months. Information on children's communication problems and the ability to communicate emotions was collected from parental reports. It was found that children with DLD reported more somatic complaints and symptoms of social anxiety than children without DLD.<sup>67</sup> For children with DLD, it was found that the nature of their communication problems might be a factor of social anxiety. Pragmatic problems were related to higher levels of social anxiety. Moreover, structural language problems (for example, speech, semantics, and coherence) were related to lower levels of emotional understanding. The semantic problem might be related to the degree of bodily unawareness, which correlated with somatic complaints.

Based on these results, the researchers pointed out that a higher level of positive emotions, awareness of the causes and consequences of emotions, as well as focusing less on internal bodily states of emotions were related to lower levels of social anxiety and somatic complaints for children with DLD. They concluded that children with DLD are more likely to benefit from interventions that focus on improving their emotional awareness, which would also be a preventive measure for internalising problems.<sup>67</sup> The study by Samson et al represents a vital start in our understanding of the relationship between the underlying difficulties of DLD children and the nature of their emotional problems. Findings from this study also indicate a need for intervention (including psychological intervention) addressing the specific difficulties of children with DLD.

## Conclusion and Future Directions

As highlighted earlier in this article, there have been numerous terms used to describe the condition of language disorders over the years. By reducing the gap in defining language disorders, that is, promoting a universal and consistent label such as “developmental language disorder” (DLD), this disorder could be accurately defined among clinicians and researchers.

Thus, the pathology and its associated underlying mechanism would then be better examined, which in turn enhances the understanding of its comorbidities as well as interventions. Studies generally indicated higher comorbidities of neurodevelopmental disorders (such as ADHD and DCD) as well as affective disorders in children with DLD, though some mixed and inconsistent findings were reported.

As pointed out by Redmond's papers in 2016 and 2020,<sup>52,53</sup> the mixed results may be related to the inconsistency of the criteria of speech and language disorders employed in the research. Therefore, working towards a more unified definition represents a vital part of the scientific quest for knowledge on DLD. Moreover, Redmond identified other issues with the research methodology of the previous studies.<sup>52</sup> Firstly, the effects of some confounding variables (for example, IQ and bilingual background) may affect the research result. Secondly, there is a predominant tendency for research to use checklists (for example, the Child Behaviour Checklist [CBCL]) which rely on informant reports and individuals with DLD might sometimes be penalised in this form of data collection. With the application of a careful subject selection procedure and the employment of different modalities of measures (for example, informant reports and standardised testing), it was believed that the quality of findings could be ensured.

Findings of longitudinal studies have shown that the relationship between DLD and comorbid conditions is of complex and bidirectional nature. As demonstrated by Helland et al,<sup>66</sup> it is very likely that specific factors related to different aspects of impairments from DLD, such as gender difference with consideration of developmental tasks in different stages of the lifespan, are involved in the mechanism of the development of various comorbid conditions. Further study on comorbidities to clarify the mechanism of factors, such as impacts of specific aspects of impairment of DLD as well as gender and developmental issues, is necessary. Besides, there might be some overlapping or distinct impairments in each of the neurodevelopmental disorders, including DLD, that

affect their co-occurrence. With a better understanding, these conditions would be identified as early as possible in the medical and educational settings. Early intervention would then be provided to children and families in need.

Finally, most research was conducted with Western populations in English-speaking countries. There is a lack of research focused on the Chinese population including the Chinese population from Hong Kong. As language is somewhat unique in different cultures, more local research on DLD and its comorbidity would be beneficial to children in Hong Kong.

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## Prolonged Screen Time Impairs Children's Language Development

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Digital media serves as an indispensable part in our life, ranging from communication to entertainment to education. As such, screens, either in the forms of smart phones, tablets, computers, or televisions, are always at one's fingertips. Like it or not, young children are unavoidably exposed to screen media at earlier ages and for longer times, as evidenced by recent population-based studies by the Department of Paediatrics and Adolescent Medicine, Li Ka Shing Faculty of Medicine, and the University of Hong Kong.<sup>1</sup> Children's screen time is foreseeably on the rise with further digital transformation sparked by the COVID-19 pandemic. In the meantime, concerns over the potential adverse impacts of prolonged screen time on children's development, including language development, are also on the rise.

While many considered excessive screen use a detriment to childhood development, the discussion indeed does not skew the negative side. There are arguments that electronic displays, by modulating the

contexts, could help maximise a child's educational potential and be conducive to developing their language skills. It was suggested that interactive learning from screen media and its generalisation to children's life experiences could augment child language. However, the above claims were considered to be marketing strategies by many others. The American Academy of Pediatrics (AAP) recently issued a policy stating, "avoid digital media use (except video-chatting) in children younger than 18 months", to discourage early media exposure to young toddlers.<sup>2</sup> Parents were also encouraged to impose limits on both the quantity and quality of screen use for their children.

Owing to the ongoing debate about whether screen media promotes or hinders children's language development, a recent meta-analysis was conducted to investigate all angles of the debate. The team of researchers from the University of Calgary (Alberta Children's Hospital Research Institute) and the University of Washington (Seattle Children's Hospital Research Institute) collaborated to scrutinise the studies that had looked into the association between screen use and childhood language development.<sup>3</sup> Forty-two eligible studies published from 1973 to 2019, yielding a total of 18,905 participants, were examined. All the participants were under the age of 12 and without any intellectual disabilities, including autism spectrum disorder. The gender ratio was almost equally balanced, with males composing 50.2% of the research population. Children's average age at which their screen use was measured was 35.7 months. Their subsequent language skills were then gauged at around 44.4 months. Measurement of screen time was obtained using questionnaires, a screen time diary, interviews or observer methods while children's language outcomes were assessed by a parent-report questionnaire or standardised assessments. The research team specifically identified three major components, namely quantity, quality, and onset of screen use, to evaluate their influence on children language development.

In their study, the quantity of screen time was defined as the number of hours spent in front the screen as well as

the duration of background television – when the television is on in a room where the child is engaging in other tasks. In a total of thirty-eight researches, the duration of foreground screen use was found to be negatively correlated with children's language development. Such an outcome could be largely explained by its disruptions on both quantity and quality of parent-child interactions whose role in promoting children's language skills has been well elucidated.<sup>4</sup> Christakis et al<sup>5</sup> found an immense reduction in the amount of parent-child conversational exchanges as displaced by the screen media. They estimated that the parents spoke 500 to 1,000 fewer words to their children who in turn vocalised less for every hour of television watched.

Tanimura et al<sup>6</sup> concluded that screen viewing did not only interfere with the quantity but also the quality of parental language input from their observational study. When parents and children focused on television programmes, parents tended to refrain from habitual conversations and limited their language use to labelling. They spoke predominately in nouns such as “doggy” and rarely made relevant comments or further descriptions. They were also found to communicate in shorter and simpler sentences. As for background television, although it is usually targeted towards an adult viewership and incomprehensible to children, it was also revealed to pose a disruptive influence on children's language development.<sup>7</sup> Parents' paying attention to the television apparently compromises parent-child interaction.<sup>8</sup> Further, background television hindered children's toy play behaviours, which are strong predictors of language skills, as explained by Schmidt et al<sup>9</sup> Children easily shifted their focused attention in play and had shorter lengths of toy play episodes given the distracting nature of background television.

That children's language development could be impaired by extended periods of screen use was clearly stated. However, screen use was inevitably a necessity at the same time. Having such a dilemma, people started to seek modulation of the quality of programming in an

attempt to offset the risk factors. In respect of the quality of programming, 25 studies from the meta-analysis results suggested that screen viewing could aid children's language development when carefully controlling the content (educational programming) and context (co-viewing). By optimising the viewing experience by using high-quality, appropriately paced, and age-appropriate educational content, children could experience benefits in language development, particularly in vocabulary growth.<sup>10</sup> It was advocated that the frequent repetition of words in such programmes could facilitate children's acquisition of lexical knowledge. Linebarger<sup>11</sup> also suggested that screen viewing was not always a sedentary and passive act. She revealed a number of educational programmes that indeed promoted communicative engagement, such as Blue's Clues and Dora the Explorer. These programmes promote speech in young children by modelling verbal interactions and encouraging their responses. The learning situation could further be enhanced through co-viewing which provides an opportunity for linguistic interaction.<sup>12,13</sup> Parents can provide scaffolding alongside and modulate the content of screen viewing whenever appropriate.

Four studies, as found from the meta-analysis, however, evidenced that toddlers under two could not benefit from the educational value of screen viewing. They suggested that children had more advanced language skills with later onset of screen use. Clear explanations on such phenomenon are yet to be established, but young toddlers' lack of symbolic awareness might account for the unattainable learning outcome.<sup>14</sup> Images presented through a screen, as a symbolic medium, might be too conceptual for young children to comprehend. Hayne et al<sup>15</sup> also found that children younger than two showed better imitation performance from live demonstrations than video demonstrations, suggesting that screen learning might not be effective for very young toddlers.

Screen exposure for children is an unavoidable ubiquity in today's society. Meanwhile, findings from the meta-analysis were in line with the recommendation

upheld by the American Academy of Pediatrics (AAP), calling for the public's attention to the deleterious impacts of prolonged screen use on children's development.<sup>2</sup> Parents' verbal interactions with children could never be displaced by the passive and sedentary act. They should significantly limit children's time spent on screens and are encouraged to have more verbal dyadic exchanges with children to facilitate children's language growth. When screen media has to be used, children should never be engaged one-on-one with the screen, and parents' co-engagement in screen viewing should always be embraced. They should scaffold screen content and supplement screen viewing with linguistic interactions, such as labelling, making descriptive comments, and asking questions of different types. As the benefits of media exposure for children under two remain doubtful, screen use in this age group should be discouraged. Parents should also recognise and be aware of their own roles in modelling appropriate media use. They should understand the potential distracting role of background media for both the parent and the child.

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## The Relationship between Language Abilities and Theory of Mind Performance in Cantonese-speaking Children in Hong Kong

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## Theory of Mind and Developmental Disorders

Theory of mind (ToM) refers to a system of social cognitive skills that help people understand what they and other people desire, think, and believe. It allows us to take perspectives and understand other people's words and deeds, make predictions about their behaviours in social situations, and adjust our own behaviours accordingly.<sup>1,2</sup> Neuroimaging studies have identified

common regions of consistent activation at the anterior dorsal medial prefrontal cortex and bilateral temporoparietal junction that are shared by all ToM tasks. In addition to this core network, different types of ToM tasks elicit activity in unique brain areas.<sup>3</sup>

The learning of ToM skills begins in early childhood and requires the integrated work of various internal conditions. These include an intact language system for verbal comprehension, production and pragmatic use, an intact auditory system for receiving verbal and nonverbal information (such as conversation, intonation and environmental sounds), and an intact visual system for receiving nonverbal signals (such as facial expression, body language, and environmental information). Successful reception, selection, and usage of the aforementioned input signals require the support of the cognitive skills of executive function to maintain attention, memory, and inhibition. Meaningful utilisation of the signals also needs the mental capability of central coherence to integrate the present information and past experiences for analysis and planning of action.

Problems in the development of any of the aforementioned functions and abilities will affect the growth of ToM and cause social communication difficulties to various extents. For example, children with autism spectrum disorder (ASD) have aroused the earliest and greatest interest in ToM research as social communication impairment is one of the core ASD deficits.<sup>4</sup> These children are usually insufficient in most of the internal supports to build up their ToM skills. For example, they frequently ignore visual and auditory communicative signals, have language impairment, and are usually inadequate in cognitive skills related to executive function and central coherence. In recent decades, research has also investigated ToM development in children with other childhood problems. It has been found that children with significant impairment in language development, hearing, vision, or attention may also be affected in their ToM development.<sup>5-9</sup> This study focused on the relationship between language abilities and ToM performance in Cantonese-speaking children in Hong Kong.

## The Interface between Language and ToM

Language is the major medium that social communication relies on. Different aspects of language, including vocabulary, syntax, and pragmatics, play important roles in our social communication. Language learning takes off rapidly at around 18 months old when the child, with joint attention, can track a speaker's intention of naming an object for him to learn.<sup>10,11</sup> ToM also starts to operate at this time when the brain allows attribution of intentions and other mental states.<sup>12</sup>

At two years old, children start to use desire-based words like “want” and “hope”, and emotion words like “happy” and “sad”.<sup>13</sup> They begin to understand that different people may like different things and have different desires. From around two and a half years old onwards, children start to use mental words like “think” and “know”. The variety of these belief-based words and the frequency of use increase with age.<sup>14</sup> Children gradually learn that different people can have different beliefs. Therefore, good vocabulary development, especially in mental state words of desire, emotion, and belief, facilitates the learning of ToM.

In simultaneous growth with vocabulary, good syntax learning allows children to understand and produce speech in an effective way for social communication as well as for internal mental representation. For example, the mastery of tensed complements is essential in successful false belief performance.<sup>15</sup> In a meta-analysis study of the relationship between language ability and false-belief understanding of children under 7 years old, it was found that the memory for sentential complements (for example, I think that ...), syntax, general language, semantic language, and receptive vocabulary all had significant correlations, in descending order, with false-belief understanding.<sup>6</sup> In addition, children with specific language impairment had significantly lower scores than the control group in ToM tasks.<sup>16</sup>



When children have become more sophisticated with literal language, they gradually learn about the nonliteral presentation of special speech intentions in daily life to achieve specific aims, for example, lies, white lies, persuasion, and sarcasm.<sup>17</sup> With their progression in pragmatic skills, they can interpret and use language appropriately and effectively in communication exchanges.

The present study was a small-scale, convenient-sample study aimed at examining the correlation between language abilities and ToM performance in 5- to 12-year-old Cantonese-speaking children in Hong Kong.

## Methodology

### Participants

A total of 35 participants, aged between 5 and 12 years, were recruited. They were referred for language assessment in five Child Assessment Centers for suspected language problems. They had no diagnosed biomedical conditions of ASD (autism spectrum disorder), intellectual disability, hearing loss, or significant visual problems. However, some participants had comorbid problems of attention problem at clinical range, dyslexia (or at risk of dyslexia), motor problems, or anxiety problem.

Of these 35 children, 17 were diagnosed with developmental language disorder (DLD), and 18 were found to have normal language development (non-DLD) at their language assessment. All participants were included in the study to examine if their language abilities correlated well with their composite ToM ability, that is, participants with high language scores obtained high ToM scores, while participants diagnosed with DLD had below-average ToM scores. Background information on the 35 participants is shown in Table 1.

**Table 1.** Background information on the 35 participants of the study

	DLD group (n=17)	Non-DLD group (n=18)
Male : Female	8 : 9	15 : 3
ADHD/ADD	ADHD: 1 (6%)	ADHD: 3 (17%)
at clinical range	ADD: 3 (18%)	ADD: 2 (11%)
Dyslexic or at risk of dyslexia	12 (71%)	5 (28%)
Other diagnoses	Fine/gross motor problems: 6 (35%) Social anxiety: 1 (6%)	Fine/gross motor problems: 4 (22%) Social anxiety: 1 (6%)
Intelligence	Average: 13 (76%) Low average: 2 (12%) Limited: 2 (12%)	High average: 1 (5.5%) Average: 16 (89%) Limited: 1 (5.5%)

The Hong Kong Cantonese Oral Language Assessment Scale (HKCOLAS) and the beta version of the Hong Kong Scales for Assessment of Theory of Mind (HKAToM) were administered.<sup>18,19</sup> Both assessments are standardised assessments that were locally developed and normed on the population in Hong Kong.

i HKCOLAS is a comprehensive language assessment designed to examine the oral language abilities of Cantonese-speaking students from 5 to 12 years of age. There are six language subtests: 1. 香港粵語語法 (Hong Kong Cantonese Grammar), 2. 篇章理解 (Auditory Story Comprehension), 3. 詞語釋義 (Word Definition), 4. 詞義關係 (Lexical-semantic Relation), 5. 故事重述 (Narrative), and 6. 名詞表達 (Expressive Nominal Vocabulary). Failing two or more of the above subtests (i.e.,  $<-1.25$  SD or scaled score  $<7$ ) can be considered as having a language disorder.

ii The beta version of the HKAToM was used in the present study as the test was not yet published at the time of the study. HKAToM examines the theory of mind in Cantonese-speaking students from 5 years to 12 years 1 month. There are seven subtests: 1. 錯誤信念 (First-order False Belief), 2. 情緒詞彙 (Emotion Words), 3. 角色代入 (Perspective Taking on Emotional Responses of Different Persons), 4. 處境轉變 (Perspective Taking on Emotional Responses upon Change of Situation), 5. 抵制與欺騙 (Sabotage and Deception), 6. 生活小故事-說話動機 (Speech Intentions in Daily Life Stories), and 7. 說話技巧 (Pragmatic Skills). The percentile score of each of the

seven subtests and a composite standardised score of all the subtests can be obtained.

## Procedures

HKCOLAS was administered followed by HKAToM which was conducted with verbal parent consent. Six speech therapists of the Child Assessment Service performed the assessments on individual children.

## Data Analysis and Results

The correlation coefficients between the performance on ToM (measured in terms of the composite standardised score of HKAToM) and six language aspects in Cantonese (measured in terms of the six subtest standardised scores of HKCOLAS) were examined. The Pearson correlation coefficients are shown in Table 2. There was a significant correlation between HKAToM and five of the six HKCOLAS subtests, showing the essential role of language in ToM performance. All the significant correlations were moderate to strong, with “Hong Kong Cantonese Grammar” and “Narrative” showing the highest and second highest correlation ( $r=.842^{**}$  and  $.754^{**}$  respectively) followed by “Auditory Story Comprehension”, “Word Definition”, and “Lexical-semantic Relation” ( $r=.598^{**}$ ,  $.544^{**}$ , and  $.519^{**}$  respectively). “Expressive Nominal Vocabulary” ( $r=.259$ ) did not show a significant correlation with HKAToM results.

Table 2. The Pearson correlation coefficients of the six HKCOLAS subtests and HKAToM

	Pearson's <i>r</i>
1. HKCOLAS - Hong Kong Cantonese Grammar	.842 <sup>**</sup>
2. HKCOLAS - Auditory Story Comprehension	.598 <sup>**</sup>
3. HKCOLAS - Word Definition	.544 <sup>**</sup>
4. HKCOLAS - Lexical-semantic Relation	.519 <sup>**</sup>
5. HKCOLAS - Narrative	.754 <sup>**</sup>
6. HKCOLAS - Expressive Nominal Vocabulary	.259

<sup>\*\*</sup> $p<.01$

## Discussion and Recommendations

### Syntactic ability and ToM

Syntax refers to the set of rules that govern the structure of sentences. Among the six language subtests of HKCOLAS, “Hong Kong Cantonese Grammar” and “Narrative” had the strongest and most significant correlation with the HKAToM results ( $r=.842^{**}$  and  $.754^{**}$  respectively). “Hong Kong Cantonese Grammar” is composed of a receptive part and a production part which examine a child’s knowledge of Cantonese syntactic structures. In “Narrative”, a child is required to listen to a pre-recorded model story with a picture book and then retell the story with the picture book. The child’s production is scored for story contents, referencing, connectives, and advanced sentence structures. Both subtests require the integration of the most linguistic skills among the six subtests, and syntactic ability is the major component being scored. The above findings that syntactic ability had the highest correlation with ToM performance are supported by a meta-analysis study on the relationship between language ability and false-belief understanding in children under 7 years old.<sup>6</sup> The study found out that “memory for complements”, which involves a specific syntactic ability, and “syntax” demonstrated the highest and second highest correlations ( $r=.66^{*}$  and  $.54^{*}$  respectively) with the performance on false-belief tasks among five language ability measures.

In social interactions, the most effective way of transferring information is through verbal communication, whether it is a direct conversation or overhearing other people’s speech. Good syntactic ability allows a child to efficiently comprehend what another person is talking about, as well as to make up effective sentences to convey their concrete or abstract ideas. In HKAToM, syntactic skills are required in all subtests, for example, to understand the presentation of test stories on emotions, perspective taking, and speech intentions. The knowledge in sentential complements is also important as required by different false-belief tasks to

consider what the story's characters think and believe. In production, appropriate syntactic skills are needed in explaining speech intentions, explaining the cause of emotions of different story characters, as well as manipulating language for pragmatic use. Therefore, the results of the two subtests concerning syntactic ability in HKCOLAS correlated the strongest with ToM performance.

### **Semantic ability and ToM**

As the understanding of other people's feelings and beliefs is essential in ToM development, children's knowledge of emotion words and mental state words reflects their ToM ability. "Expressive Nominal Vocabulary" of HKCOLAS did not significantly correlate with HKAToM composite scores ( $r=.259$ ) because this language subtest only examines concrete nouns and does not include vocabulary on mental states or emotions, which are verbs or adjectives. On the other hand, "Lexical-semantic Relation" had a significant and moderate correlation ( $r=.519^{**}$ ) with HKAToM results. "Lexical-semantic Relation" examines a child's knowledge of the relationships of word meanings. The assessment tasks include giving categorical items, providing categorical names, giving antonyms and synonyms (both are adjectives), and interpreting the underlying meaning of 4-character idioms. Good knowledge of adjectives for antonyms and synonyms may imply a good general knowledge of adjectives that include emotion words which are examined in HKAToM tasks. The 4-character idioms are expressions with special meanings condensed into four Chinese characters. While some transparent idioms may have their meaning depicted literally in the 4 characters, a lot of them are opaque. This means that they convey an underlying meaning through a kind of figurative language and the true meaning goes beyond the surface of words. The skills in comprehending the meaning of 4-character idioms are related to the skills required in interpreting the speech intentions, for example, lies, white lies, persuasion, and sarcasm, in "Speech Intentions in Daily-life Stories" of HKAToM. In both tasks, a child

needs problem-solving skills to comprehend expressions with hidden meanings concealed beneath the words being heard. The special meaning of the expressions actually shows the true intention of the speakers.

"Word Definition" also had a significant correlation ( $r=.544^{**}$ ) with HKAToM results. In this subtest, a child is given some familiar concrete nouns and requested to give their definitions. Besides the general expressive skills that are required for both the "Word Definition" and HKAToM subtests, a child also needs to take perspective when selecting important characteristics to define a word in an objective way. A young child initially understands an object as learned from his own experiences. With time, his knowledge about the object grows and allows him to extract the core conceptual meaning, though he may continue to have unique personal experiences with the object. In giving the definition of a word, a child needs to disregard his related experiences from his own perspective and provide an objective description of the defining or salient characteristics of the word. Taking perspective to see things from different people's points of view is a basic mental skill required by all HKAToM tasks.

### **Auditory story comprehension and ToM**

"Auditory Story Comprehension" had a significant correlation ( $r=.598^{**}$ ) with HKAToM results. In "Auditory Story Comprehension", a child is required to listen to two short stories and answer both literal and inference questions after each story. A story is made up of a sequence of sentences. In addition to the comprehension of individual sentences, a child is also required to attend to and relate all the sentences in a story for his overall comprehension, analysis, and interpretation. He obtains literal information as shown directly in the story. He takes perspective of each character to understand their personality, feelings, and actions. He also needs to analyse linguistic cues and use his world knowledge to make inferences so that he can integrate all information in a coherent and meaningful way. Only by doing so can he reason out the interactions among different characters, follow the story flow, and

understand the cause and consequence of situations. The skills in attending to all auditory information, integrating linguistic knowledge, using one's world knowledge, taking perspectives, relating information coherently, and making inferences are all essential in working on HKAToM tasks.

## ToM and DLD

Results of the present study show that children's ToM performance matched their language abilities, whether they had DLD (n=17) or normal language development (n=18). ToM is always acquired through the medium of language, whether it is the learning of mental words, sentential complements, speech intentions, or faux pas situations. Children with DLD suffer from slow language learning and can learn ToM concepts only when their language abilities allow them to do so at a later time compared with their peers. Studies show that children with DLD had ToM abilities comparable to the language-matched but younger children.<sup>20,21</sup>

## Speech therapy help in ToM learning

With evidence of the strong developmental relationship between language and ToM, it is essential to include ToM training in speech therapy to help children with language disorders. Successful learning of ToM will help their social cognitive development and equip them with the most indispensable tools for effective communication.

Traditional speech therapy on structural language helps children with language disorders build up basic communication skills in comprehending and producing verbal messages for basic ToM learning. A specific focus on emotion words, mental state words, and sentential complements are essential in improving ToM-related usages of preschool children. For older children, teaching special speech intentions like lies, white lies, figure of speech, sarcasm, and persuasion, help them identify underlying meanings of speech in their everyday activities and employ these skills to achieve their needs.

Stories with faux pas situations are good exercises in analysing communication failures in training children's pragmatic skills. Frequent casual chats at home or with friends about wants, thoughts, and feelings help children share different views and perspectives, making implicit thoughts explicit and expressing them in words. Last of all, therapists can help parents make good use of interesting story books and favourite cartoons to help children gain social knowledge from the experiences of different characters described. Every character has a special personality and an interesting encounter, good or bad. What parents and children think these characters think and feel about in their own encounters will certainly arouse interesting discussion.

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## Working Towards a Common Diagnostic Framework to Describe Children with Language Learning Difficulties: A Local Perspective

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Language impairment is one of the most common developmental problems for children in their course of development. Different terminology has been used to describe unexplained language learning problems (that is, language impairment without a known cause) such as developmental dysphasia, language delay, specific language impairment (SLI), and developmental language disorder (DLD).<sup>1,2</sup> The main reason for having so many diagnostic labels is that there is a lack of consensus on

what the label describes, and many professional groups, such as psychologists, speech-language therapists, and doctors, are involved in giving these labels to children. The lack of agreement about terminology means that people will either misunderstand the condition or doubt its reality.<sup>2</sup> It also causes barriers in identifying children for prevention and intervention services. It also affects day-to-day clinical practice and research.<sup>3</sup> It is very difficult to assemble information from the research literature because one must search using multiple terms.

In 2016 and 2017, two important papers written by Professor Dorothy Bishop and colleagues at the University of Oxford were published to address the issue.<sup>4,5</sup> An international group of experts (the CATALISE panel) which included speech-language therapists and pathologists, educational psychologists, paediatricians, psychiatrists, specialist teachers, and charity representatives from English-speaking countries (Australia, Canada, Ireland, New Zealand, United Kingdom, and USA), led by Professor Dorothy Bishop, conducted several rounds of Delphi consensus studies and have reached a good consensus.

The panel agreed on the term “Language Disorder” to refer to children with language difficulties that create obstacles to communication or learning in everyday life and where we know from past research that they are unlikely to catch up spontaneously. The panel also agreed on the term “Developmental Language Disorder” (DLD) for when the language disorder is NOT associated with a known biomedical condition such as brain injury, autism spectrum disorder (ASD), intellectual disability, and genetic conditions such as Down syndrome, cerebral palsy, and sensorineural hearing loss. Developmental Language Disorder

(DLD) is a lifelong condition that is characterised by difficulties in the ability to learn and use language. The term refers to persistent language difficulties that have a significant impact on a child's everyday social interactions and educational progress. The term DLD describes children who are likely to have a language problem that endures into middle childhood and beyond. This condition has a significant negative impact on children's everyday social interactions and schooling. As such, identification and support are crucial.

Recognising the problem of having no common diagnostic framework to describe children who experience language learning difficulties in Hong Kong, the author teamed up with Dr Anita Wong from Human Communication, Development, and Information Sciences, Faculty of Education (the University of Hong Kong), Miss Joanna Cheung, Specialist (Speech Therapy) from the Speech Therapy Service Section of the Education Bureau, and Miss Jody Lam, Chairperson of the Hong Kong Association of Speech Therapists; together they formed a special interest group on "Terminology for Child Language Disorders" (TCLD). The TCLD core team aimed to arrive at a consensus on a diagnostic framework and the diagnostic terminology used to describe language disorders in children in Hong Kong.

The first step is to identify the gaps in the diagnostic framework and the diagnostic labels used by speech therapists in the community. The TCLD group gathered language assessment data from 13 cases involving children of different ages and different language levels. This data was written as case studies, and the TCLD group invited members from the four speech-language therapy training programmes, speech-language therapists (SLTs) working for major service providers, and

SLTs in private practices to take part in the discussion. Finally, a total of 27 members were involved in the TCLD group. All 27 members were invited to give a diagnostic label to the 13 cases and state the reason for giving such labels. Members' responses were gathered and analysed by the core team members. As predicted, the diagnostic labels for the 13 cases varied considerably. The same case may receive as many as ten different labels. Members appeared to do this exercise with an internal system of diagnostic labels, but there did not seem to be a system that was shared among them, leading to the diversity in responses.

To reconcile the gaps identified, the core group invited the members from the four speech-language therapy training programmes for several rounds of discussion with an aim to gather feedback on the diagnostic framework that each speech therapy programme used to teach students and report the challenges in the application of the existing framework to the 13 cases that they did. Most importantly, the core group and the members of the four speech-language therapy training programmes had to make suggestions for the way forward.

After several rounds of discussion, the members agreed to adopt the recommendations reported<sup>4,5</sup> in principle and a document named "Diagnostic Terminology for Child Language Disorders in Chinese" was prepared. The document first outlined the background of using diverse diagnostic labels for children with language disorders. It also summarised some key concepts which often raises concern in the diagnostic process (for example, cognitive discrepancy, linguistic subtypes, and disorder versus delay). It provided details of each diagnostic term and the criteria that distinguished the different terms in the

diagnostic system that the TCLD group recommended. The document was sent to all 27 members of the TCLD group, and all members were invited to do the diagnostic label exercise for the 13 cases using the suggested framework. The results came back, and it showed that the diagnostic labels that the members used were more consistent. Members reflected that the framework was easy to use and hope that the suggested framework will be disseminated further so that practising SLTs of Hong Kong will be able to learn and understand more about the suggested diagnostic framework.

In the Child Assessment Service, the team of SLTs have adopted the framework recommended by the TCLD group. The diagnosis of “Language Disorder” is to be made when a child is found to have language difficulties in norm-referenced- tests and other sources of information (for example, interview and questionnaires with parents or caregivers, clinical observation, or criterion-referenced tests) has language difficulties that impact on their social and/or educational functioning, and has language difficulties that are likely to persist into middle childhood and beyond.

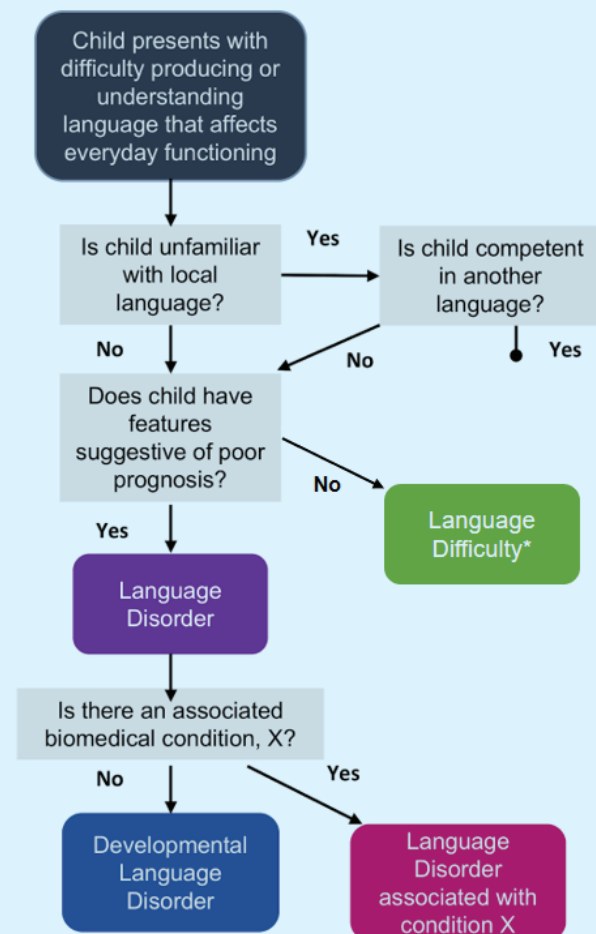
Language Disorder can be further specified as either Developmental Language Disorder (DLD) or Language Disorder associated with X, where X is the differentiating condition(s) such as autism spectrum disorder or cerebral palsy. A child with a differentiating biomedical condition should be diagnosed as having a Language Disorder associated with X, but not DLD.

DLD can co-occur with other neurodevelopmental conditions (for example, dyslexia or ADHD), but language learning problems are not part of these complex conditions. Therefore, a child can be diagnosed as having DLD co-occurring with dyslexia. To

receive a diagnosis of DLD, the child should have a nonverbal IQ score no lower than 70, the cut-off for intellectual disability.

“Language difficulty” is a term used to describe children with language learning problems who are under 4 or 5 years of age, and who do not have features suggestive of poor prognosis and do not have many risk factors.

The following is a flowchart illustrating the decision-making process for the diagnosis of language difficulty, Language Disorder, Language Disorder associated with a biomedical condition, and DLD.



Source: [Diagnostic Terminology for Child Language Disorders in Chinese](#). Unpublished manuscript.<sup>6</sup>

The core group is still working on ways to disseminate the framework so that the practising SLTs in Hong Kong can understand

the framework and put it into clinical practice. It is hoped that the framework will reduce the disagreement in the diagnostic labels used for describing language-impaired individuals in Hong Kong. The core group is also planning to approach other professional organisations (for example, the Hong Kong Psychological Society, the Hong Kong Society of Child Neurology & Developmental Paediatrics) and share the updated diagnostic terms with professionals who also work with children with language learning problems. It aims to facilitate the health professionals such as doctors and psychologists to understand what the diagnostic labels mean.

The work of the TCLD group has not come to an end. We have to find ways to increase the awareness of the general public. We have to promote the use of the framework to all practising speech therapists in Hong Kong. We have to keep ourselves up to date and refine the diagnostic framework when new evidence comes out. It is only the end of the beginning.

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## Recent Scientific Presentations

**Supporting children with Complex Communication Needs (CCN) in the Hospital: Train-the-Trainer Programme** on 8 December 2021 and 15 December 2021 at Hong Kong Children's Hospital by Dr CHOW Chin-pang, Jasper, TSANG Yee-ha, Lucia, SIU Kit-ling, Elaine, LAM Ling, Lorinda, CHAN Shuk-yan, Carol.

**Clinical seminar: intellectual assessment and assessment of adaptive functioning for children with physical and multiple disabilities** on 24 November 2021 at Department of Psychology, The University of Hong Kong by LAM Ling, Lorinda.

**Diploma in Special Education (Special Learning Needs Education Course in Autism/Asperger's Syndrome)** on 11 November 2021 at HKU SPACE by LAM Ling, Lorinda.

**General approach to clinical assessment of children: assessment of behavioral, social and emotional aspects** on 10 November 2021 at Department of Psychology, The University of Hong Kong by TSANG Yee-ha, Lucia.

**WISC-IV(HK) & WIPPSI-IV (HK) – case conceptualization & report writing** on 9 November 2021 at Dept of Psychology, The Chinese University of Hong Kong by LAU Wai-ye.

**Online certification workshop of Copying Speed Test for Hong Kong Secondary Students** on 5 November 2021 at Hong Kong Occupational Therapy Association by NG Wai-fong and CHUI Mun-ye.

**General approach to clinical assessment of children: assessment of behavioral, social and emotional aspects** on 3 November 2021 at Department of Psychology, The University of Hong Kong by LAU Wai-ye.

**5 years data on Department of Health Child Assessment Service (CAS) preschool children at risk of dyslexia and their comorbidities** on 30 October 2021 at Joint Annual Scientific Meeting 2021 organized by The Hong Kong Paediatric Society, Hong Kong College of Paediatricians, Hong Kong Paediatric Nurses Association, Hong Kong College of Paediatric Nursing by Dr LAI Ka-yau.

**Hearing assessment in children with Waardenburg syndrome** on 30 October 2021 at Joint Annual Scientific Meeting 2021 organized by The Hong Kong Paediatric Society, Hong Kong College of Paediatricians, Hong Kong Paediatric Nurses Association, Hong Kong College of Paediatric Nursing by Dr CHAN Wai-man.

**Training course for Special School Teachers – assessment & diagnosis on children with Special Educational Needs (SEN)** on 28 September 2021 at Centre for Special Educational Needs and Inclusive Education, The Education University of Hong Kong by LEUNG Wing-in, Windy.

**ChildSim: Communication needs of children with complex communication needs (CCN) across different pathologies in hospital and community contexts** on 24 September 2021 at Hong Kong Children's Hospital by Dr LAM Chi-chin, Catherine, Dr CHOW Chin-pang, Jasper, SIU Kit-ling, Elaine.

**Children with genetic causes of hearing impairment: developmental profile of children with non-syndromic hearing impairment** on 19 August 2021 at The Hong Kong Society of Child Neurology and Developmental Paediatrics – Neurodevelopmental Conference by Dr CHAN Wai-man.

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