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<td><strong>Citation</strong></td>
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<td><strong>Issued Date</strong></td>
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<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10722/48804">http://hdl.handle.net/10722/48804</a></td>
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Verb Diversity of Cantonese-Speaking Children with Down Syndrome

Chau Chi Wah, Eva

A dissertation submitted in partial fulfilment of the requirements for the Bachelor of Science (Speech and Hearing Sciences), the University of Hong Kong, May 2, 2003
Abstract

Language samples from six Cantonese-speaking children with Down syndrome (DS) and six typically developing children matched with mean length of utterance (MLU) were analysed for their production of verbs. The samples were obtained during free play with a standardized set of toys. Results showed that DS children used a verb in a smaller percentage of 100 utterances used for analysis. The number of verb and the diversity of verb use in the 5 subcategories (main, serial, compound, function and modal) were generally comparable between the groups. For the DS group a significant correlation between MLU and verb diversity [NDV(all)] was found. However, the correlation between the total number of verbs [TNV(all)] was not significant. In the TD-LM group, a significant positive correlation was found between MLU and total number of verbs [TNV(all)] and between MLU with verb diversity [NDV(all)]. Results and implications were discussed in light of previous findings.
Language Development in children with Down syndrome

What is Down Syndrome? Down syndrome (DS) is a genetic disorder and individual with DS has three copies of chromosome 21 instead of two as in normal individual. There are three types of Down syndrome: Trisomy 21, Translocation and Mosaicism. Approximately, 95% of the DS population are of the trisomy 21 type (Kemper, 1988).

Individual with DS are often identified by their characteristic physical features and cognitive delay (Kemper, 1988). However, a lot of these individuals also have hearing loss and difficulties with motor speech control. The relationship between cognitive ability and language development has been documented in typically developing children. For example, the acquisition the words of disappearance (e.g. gone) were found to be related to the ability to solve object-concept tasks (Gopnik & Meltzoff, 1986). Maturational hypothesis proposed that DS children’s emergence of language mainly determined by organic schedule (Smith, von Tetzchner & Michalsen, 1988). Having delay in cognitive development in children with DS, their learning of words would be delayed. Given their difficulties with motor-speech control and hearing loss, children with DS’s speech intelligibility was often reduced. As a consequence, as Buckley (1993) argued, mother-child interaction was affected. Parents would use shorter sentence with their children with DS. Therefore, the language-learning environment would indirectly affect DS children’s learning of grammar and syntax (Buckley, 1993). DS’s children’s problems in working memory would reduce their ability to hold longer sentences (Buckley, 1993) and have difficulty on word selection and formulation (Miller, 1999), thus affect the development of syntax. All these could contribute to the language learning difficulties commonly faced by children with DS (e.g. Grela, 2002; Miller, 1988; Stoel-Gammon, 1990).

Language development. While typically developing children show a correlation between mental age and language abilities, DS children are reported to have language skills lagging
behind their mental age. (Chapman, 1995; Miller, 1999; Stoel-Gammon, 1990). Regarding language processes, DS children are reported to have receptive language abilities in advance of their expressive language abilities (Chapman, Chapman, 1995; Miller, 1999; Seung, Schwartz, & Kay-Raining, 1998). When we look into the four domains of language including phonology, semantic, syntax and pragmatic, children with Down syndrome have relative strength in semantics while syntax is a particular challenge for them (Chapman, 1995; Miller, 1999; Stoel-Gammon, 1990).

A review of the literature found that vocabulary development in children with DS is similar to their mental age-matched peers at the early stage of language development. Both groups of children start to understand and use single words at the same time in terms of mental age (Cardoso-Martins et. al, 1985), and their first 50 words are comparable in terms of proportion of word type categories and content word meanings (Chapman, 1995; Miller, 1999). However, DS children demonstrate a slower rate of vocabulary acquisition, their performance on vocabulary gradually lags behind their mental age as they grow up (Cardoso-Martins et. al, 1985; Miller, 1999). Although semantics is found to be an area of relative strength for children with Down syndrome, their development in semantics is still below level expected for their mental age.

In addition, within the area of semantics, DS children are found to have particular difficulty in morphosyntax (Vicari, Caselli & Tonucci, 2000). It was found that DS children omitted more grammatical function words (e.g., copular and auxiliary and modal auxiliary) than did younger language-matched controls (Eadie, Fey, Douglas & parsons, 2002; Vicari et. al., 2000). Research also found that the dissociation of morphosyntax with lexical development increases with advancing mental age (Vicari et. al., 2000).

*Verbs*
Verbs as lexical items, also play a major role in with children's acquisition of syntax. Hesketh & Chapman (1998) suggested that verbs provide an interface for later syntactic development. For example, at the early stage of syntactic development, English verbs code the sense of either a subject doing an action or an object is being acted on resulting a Noun-Verb combination. Later on, verbs code a schema relating a subject and the affected object by connecting two nouns, for example, 'Mary eats an apple,' resulting in a more complex sentence which is made up of three words combination. Crystal (1985) also suggested that verbs are central to the subsequent development of sentence structure. He stated that the choice of verbs has an effect to the use of other elements in sentences. For example, when we use a verb of cognition (e.g. think), we need to use a clause to follow it (e.g. I think you should be more careful). Therefore, the use of a verb of cognition would result in a more syntactically complex sentence.

There have been studies examining the use of different verb type categories and the variety of verb meanings in DS children. Hesketh & Chapman (1998) compared the production of grammatical verbs (e.g. auxiliary verbs, copular verbs, modal verbs) and lexical verbs (e.g. non-copular main verbs, infinitives, phrasal verbs) between 29 DS children with normally-developing children matched on mean length of utterance. They found that DS children produced fewer lexical and grammatical verbs per utterance than the normal controls. However, they found that the DS group produced lexical verbs in a greater diversity. Similarly, Grela (2002) compared seven DS children with their MLU-matched peers on the production of lexical verbs. His study repeated results different from Hesketh & Chapman (1998). While this group of DS children produced a greater diversity of lexical verbs than the normal MLU-matched peers, they used comparable number of lexical verbs per utterance. Still, the result about greater lexical diversity of lexical verb use in DS children has to be further confirmed due to the following reasons. First, the two groups of the participants
showed a significant age gap in the two studies. Participants in the DS group were on average 12 years (in Hesketh & Chapman, 1998) and 8 years (in Grela, 2002) older than the MLU-matched typically developing children. Second, the contexts used for eliciting the language sample might result in bias. For their analysis, Hesketh & Chapman (1998) used narrative samples in which participants were asked to retell their favourite movie, story, personal event, or to describe pictures. A 3-year-old child who has difficulty with the narrative genre is likely to use fewer verb types. As suggested by Grela (2002) and Hesketh & Chapman (1998), the increased lexical verb diversity repeated in the Down syndrome group could be due to increased exposure over time as they have more life experience and world knowledge. It is likely that group difference in lexical verb diversity will be reduced if there is a small age gap between the DS and language-matched typical-developing children. Therefore, reduced age difference between DS group and control group may show an opposite result.

**Role of verb in Cantonese**

Studies on Cantonese-speaking children with DS were limited. One earlier study investigated the declarative and imperative performatives of DS children (Tam, 1994). There has been no published report in verb use in Cantonese-speaking children with Down Syndrome.

*Verb versus Noun.* As Cantonese shares the same basic sentence structure as English (Subject – Verb – Object) (Matthew & Yip, 1994), therefore, the centrality of verbs in syntactic development, which was discussed earlier, applies to Cantonese as well. Apart from this, there are several reasons to focus on verbs but not other word forms in Cantonese. Luke & Nancarrow (1998) analysed the relative frequency of different word classes in Cantonese adult speech in a written text. The text was made up of 22,426 words Verb was found to have the highest percentage of occurrence (30.4%) among all the grammatical classes of words followed by nouns which made up of 18.8% of occurrence. In addition, in a
cross-linguistic study of English, Italian and Mandarin adult language input to children (Tardif, Shatz & Naigles, 1997), Mandarin adult input was characterised by more verb types and token than nouns. A reverse pattern was observed in English and Italian parent-to-child speech. Tradif et. al. related this finding to pro drop feature of Mandarin, a feature that is shared by Cantonese. While nouns were omitted, verbs become more salient to Chinese children. Another study done by Tradif (1996) found that most of the Mandarin speaking children produced more verbs than noun. Again, she related this with the pro-drop feature, their high frequency in input and the morphological simplicity of verbs. As Cantonese shares the same grammatical structure in most major respects with Mandarin (Matthew & Yip, 1994), the above findings would be expected in Cantonese as well. In an analysis of 161 longitudinal language samples from eight Cantonese-speaking children, Cantonese-speaking children drop subjects (80% versus 30%) and objects (47% versus 7%) at a much higher rate than English-speaking children at age two (Lee, 2000). This piece of data in Cantonese-speaking children echoed Tradif’s (1996) finding on verbs in Mandarin-speaking children. Clinical data also support this view, in revealing the 100 most frequently used words produced by children between 2;6 to 5;6, 38 of them were verbs while only 11 of them were nouns (Fletcher, Leung, Stokes & Weizman, 2000). All these information suggested that verbs might be a productive place to start when looking at group and developmental differences in Cantonese children.

Measurements of lexical diversity

Extensive researches have examined lexical diversity in typical and language-disordered children. Among different measures of lexical diversity the total number of word (TNW), the number of different word (NDW) and the type-token ratio (TTR) were the well-documented ones (Grela, 2002; Hesketh & Chapman, 1998; Klee, 1992; Miller, 1991; Richards, 1987; Stokes & Fletcher, 2000; Watkins, Kelly, Harbers & Hollis, 1995). This is probably because
they can be directly obtained from a language sample using a simple arithmetic procedure. Templin (1957), as cited in Watkins et. al. (1995), suggested that a type-token ratio of 0.5 would be a general normative index on lexical diversity for children. However, for TNW and NDW, no normative reference was reported in the literature. The validity of three measures identified above have been evaluated on their validity (Klee, 1992; Miller, 1991; Richards, 1987; Watkins et. al., 1995). Their characteristics are summarized below:

**Total number of words (TNW).** TNW is obtained by counting the total number of words (token) in a fixed (time/utterance) length language sample. It is suggested as ‘an index of general language facility’ (Klee, 1992) or ‘overall language productivity’ (Miller, 1991).

Miller (1991) found that in language samples of fixed time, TNW demonstrated significant correlation with MLU in typically-developing children. Klee (1992) also repeated this relationship in both typically-developing children, and children with specific language impairment (SLI), using language samples of fixed number of utterances. Finally, it is suggested TNW can be used as one of the measures of general language performance (Miller, 1991).

**Number of different words (NDW).** NDW is obtained by counting the number of different words (type) in a fixed (utterance/token) length of language sample. NDW measures a child’s lexical knowledge, particularly in terms of diversity (Stokes & Fletcher, 2000).

According to Miller (1991) and Klee (1992), NDW is correlated with MLU and differentiates children with typical language skills and children with language impairment. Therefore, they suggested that NDW, together with other supplementary measures, can be used as a diagnostic indicator of lexical diversity (Miller, 1991).

**Type-token ratio (TTR).** TTR is the ratio of the number of different words (type) to the total number of words (tokens). It is also considered as a general measure of lexical diversity (Klee, 1992). Although TTR allows comparison between sample of different number of
words; its value changes very little with age (Klee, 1992). In addition, it was found to have an inverse proportion with sample size (Richards, 1987). As sample size increases, TTR value gradually plateaus. Richards (1987) found that the ratio would only increase again slightly if there is a change of topic. To conclude, TTR does not show either developmental or diagnostic characteristics in typical developing children or children with specific language impairment, and its use with other language disordered groups was unknown (Watkins et. al., 1995; Klee, 1992).

After reviewing the three measures that were well documented in the literature, TNW (token) and NDW (type) would be appropriate for the investigation of verb use in DS children in the present study. As Watkins (1995) suggested, when modified, NDW and TNW would allow us to understand particular lexical strengths and weaknesses within grammatical classes (e.g. verb). Conti-Ramsden & Melanie (1997) used the total number of verbs (TNV) and the number of different verbs (NDV) to learn about verb use of children with SLI. They found that children with SLI used a smaller number of verbs and a smaller number of different verbs than their normal language-matched peers. Those support the use of TNV and NDV in Cantonese-special children in DS in this study.

**Research questions**

Given the centrality of verbs in syntax and children in DS’s particular challenge with syntactic development, it will be informative to excise DS children’s verb use for a better understanding of the nature of their syntactic deficit. TNW and NDW were significantly correlated with MLU (Miller, 1991), it would be interesting to know TNV and NDV correlated with MLU given the centrality of verbs in syntax. Research questions of this study are:

1. Do children with DS use fewer verbs in a verb-containing utterance than typically developing children matched by MLU (TD-LM)?
2. Do children with DS used fewer numbers of verbs than TD-LM?
3. Do children with DS used less diverse set of verbs than TD-LM?
4. Do TNV and NDV correlate with MLU in children with DS and TD-LM?

Method

Participants

Children with Down Syndrome (DS)

Seven Cantonese-speaking children with DS, five girls and two boys, were recruited through the Hong Kong Down Syndrome Association. Information about the child’s language diagnosis and mental age were not available from the parents or the Association. The case history obtained from the parents indicated that none of these children have a history of epilepsy. They were attending in special schools for mildly handicapped, or integrated schools. The school placement suggested they might have mild grade mental retardation.

Hearing screening. All of these seven children with DS passed a hearing screening given at 40dB HL for the frequencies of 500, 1000, 2000 and 4000 in at least the better ear. American Speech- Language and Hearing Association (1985) recommended a hearing screening at 20dB HL. However, children with Down Syndrome showed a high prevalence of mild to moderate hearing loss which associated with otitis media (Chapman, 1995), an elevated level of hearing screening was used.

Phonological assessment. Given that children with Down Syndrome have a high prevalence of speech problems. The Cantonese Segmental Phonology Test (So, 1993) was administrated for all these seven children in DS. All of the children showed speech errors at the single word level. The percentage of phonemes correct (PPC) ranged from 73% to 99% at the single word level, suggesting that their speech intelligibility was good to mildly-moderately unintelligible (Paul, 1995). The results were used to estimate their speech/
phonological abilities, and as a reference for translation their language samples, especially their partially intelligible utterances. However, the author’s subjective impression was that PPC scores might overestimate their intelligibility at the conversational level. All the children in DS group were above 70% intelligible at conversation level where the topic was on objects that were physically present and activities occurring there and then.

*Language Assessment.* The DS children were given a language assessment to ascertain their language impairment. Reynell Developmental Language Scale (Cantonese version) (HK Reynell Committee, 1987) (RDLS) was administrated. As some of the children were above the age for the RDLS, which was designed for children from 1;0 to 7;0 years old, their standard scores (with reference to their chronological age) were not available. For these children, only raw scores were presented.

*Typically developing children (TD-LM)*

A group of typically-developing children at the same language level as the DS children also participated in this study. These children were selected from a pool of 70 participants, who were aged 2;6 to 5;6, involved in an earlier research on longitudinal study of language development. Two of the children had recruited specially for this study in order to match with the children in the DS group. These were all typically-developing children with no history of language development and who passed the Reynell Developmental Language Scale (Cantonese version) (HK Reynell Committee, 1987).

*Procedure*

*Language sample collection*

The author collected language sample of the children in DS group and the two typically-developing children recruited for this study during free play with the author with a standard set of toys. The set of toys included a baby with detachable clothes, a washbasin, some shampoo and soap, a comb, 2 pieces of cloths, a pillow, a cook set with utensils and food.
(Appendix A for the full list of toys). These toys were used to elicit talks about daily routines such as bathing, dressing, eating and sleeping which children as young as two years of age would be familiar with. The whole data collection procedure was video- and audio-taped. As the discourse pattern of the adult would affect the child’s use of language (Miller, 1981), when interacting with the children, the author tried to maintain their interest and enthusiasm. Closed-end questions and commands were kept to a minimum.

The language samples from the 70 archive database were elicited using a similar set of toys involved in the same daily routines by a research assistant who was an undergraduate student of speech and hearing sciences.

*Transcription and utterance exclusion*

The language samples from the 70 archive database had been phonetically transcribed. The author transcribed the language samples of all DS children and 2 typically developing children orthographically from audiotapes.

To increase the representativeness of the language samples, all of the language samples (including those from the database) were reviewed. Utterances which do not reflect the child’s syntactic knowledge were excluded according to the following criteria:

1. Fillers, exclamations and symbolic noise;
2. Utterances that were recited from songs, rhymes and commercials;
3. Responses from closed-end questions, such as wh-questions which require a single constituent response (e.g. *neil go3 mat1je5 lei4 gaa3? what is this?*);
4. Repetition of his/her own utterances;

For exclusion of response to questions, the nature of the question and the child’s responses were considered simultaneously. A child’s utterance would not be excluded just because the child was asked an A-not-A or a wh-question.
For example, we would exclude the child’s utterance in *Example 1*, but not exclude the child’s utterances in *Example 2*:

*Example 1*: Investigator: mat1je5 lei4 gaa3? (What is this?)

Child: mat6mat6 (Sock)

*Example 2*: Investigator: mat1je5 lei4 gaa3? (What is this?)

Child: nei1 go3 hai6 bi4bi1 sik6 gaa3. (This is for the baby to eat.)

**Group Matching**

For this analysis of verbs to be meaningful, only children whose MLU (after utterance exclusion) were 1.9 or above were included for this study. One of the seven children with DS was excluded from this study as his MLU was 1.66 and was using primarily object names. Eventually, the DS group consisted of six children, one boy and five girls. The mean MLU of DS children was 2.7 with range from 1.94 to 3.67 (SD = 0.7). Their mean age was 8;08 with a range from 5; 10 to 10;10 years old. Table 1 summarize the information of DS group.

Table 1.

The age, gender, MLU, the score obtained form RDLS- receptive and PPC for each child in the DS group.

<table>
<thead>
<tr>
<th>Children</th>
<th>Name</th>
<th>Age/ Gender</th>
<th>MLU</th>
<th>RDLS (receptive) Raw score</th>
<th>Standard score</th>
<th>PPC (At single word level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1</td>
<td>CTY</td>
<td>5;10/F</td>
<td>1.94</td>
<td>40</td>
<td>&lt; -3.4</td>
<td>73%</td>
</tr>
<tr>
<td>DS2</td>
<td>KOY</td>
<td>7;0/F</td>
<td>2.13</td>
<td>39</td>
<td>&lt; -3.4</td>
<td>74%</td>
</tr>
<tr>
<td>DS3</td>
<td>LYL</td>
<td>10;10/M</td>
<td>2.29</td>
<td>47</td>
<td>N/A</td>
<td>90%</td>
</tr>
<tr>
<td>DS4</td>
<td>WSC</td>
<td>9;06/F</td>
<td>2.78</td>
<td>46</td>
<td>N/A</td>
<td>89%</td>
</tr>
<tr>
<td>DS5</td>
<td>CHT</td>
<td>8;01/F</td>
<td>3.36</td>
<td>51</td>
<td>N/A</td>
<td>99%</td>
</tr>
<tr>
<td>DS6</td>
<td>NKY</td>
<td>8;11/F</td>
<td>3.67</td>
<td>51</td>
<td>N/A</td>
<td>94%</td>
</tr>
</tbody>
</table>
Note: MLU = Mean length of utterance; RDLS = Reynell Developmental language Scales: Revised (Hong Kong Version); PPC = Percentage of phoneme correct; N/A = Not available

Four children from the 70 archive database, whose MLU were between 2.66 to 3.46 (after utterance exclusion) and the two children recruited for this study, were chosen to match groupwise with children in the DS group on MLU. This group of TD-LM children consisted of three girls and three boys. Their mean MLU was 2.74 with range from 1.96 to 3.47 (SD = 0.54). Their mean age was 2; 10 with a range from 1;10 to 3;11 years old. Table 2 summarize the information of TD-LM group.

Table 2.
The age, gender, MLU, and the score obtained form RDLS- receptive for each child in the TD-LM group.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Name</th>
<th>Age/</th>
<th>MLU</th>
<th>RDLS (receptive)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Gender</td>
<td></td>
<td>Raw score</td>
</tr>
<tr>
<td>TD-LM 1</td>
<td>KHC</td>
<td>1;10/F</td>
<td>1.96</td>
<td>17</td>
</tr>
<tr>
<td>TD-LM 2</td>
<td>CWM</td>
<td>2;03/M</td>
<td>2.34</td>
<td>27</td>
</tr>
<tr>
<td>TD-LM 3</td>
<td>YCH</td>
<td>2;11/M</td>
<td>2.66</td>
<td>46</td>
</tr>
<tr>
<td>TD-LM 4</td>
<td>NMC</td>
<td>3;06/F</td>
<td>2.87</td>
<td>50</td>
</tr>
<tr>
<td>TD-LM 5</td>
<td>CSY</td>
<td>2;11/F</td>
<td>3.14</td>
<td>38</td>
</tr>
<tr>
<td>TD-LM 6</td>
<td>CKY</td>
<td>3;11/M</td>
<td>3.46</td>
<td>55</td>
</tr>
</tbody>
</table>

Note: MLU = Mean length of utterance; RDLS = Reynell Developmental language Scales: Revised (Hong Kong Version)

Coding of Verb Production

The first 100 utterances after utterance exclusion were used for data analysis so that the chance for producing verbs would be equal for each participant. All verbs were identified and categorized into five subcategories including (1) Main verb -- verbs of action (e.g. sai2;
wash); verbs of perception (e.g. tai2; see), verbs of cognition (e.g. gok3dak1; feel). (2) Serial verb --two or more verbs or clauses without any marker indicating what the relationship is between them. (e.g. maai4 ping4gwo2 sik6; buy an apple to eat) (3) Verb compound --verbal compounds including (a) parallel verb compounds in which the compound shares the same syntactic or semantic properties as the constituent verbs (e.g. fan1 saan2; separate spread) and (b) resultative verb compounds in which “the second element signals some result of the action or process conveyed by the first element” (Li & Thompson, 1981, p. 55) (e.g. cii3 hoil; cut open). (4) Function verb -- copular verb (hai6; is) and verb of existence (jau5 have, mou5; have not). (5) Modal verb -- modal auxiliaries, which Luke & Nancarrow (1998), include 10 core members and 7 non-core members (e.g. ho2ji5; can, wui5; will, can) (Appendix B for the full list of auxiliary verbs). While the other verb subcategories occur independently as the only verb in an utterance the modal verbs and function verbs could occur with a main verb.

Scoring of verb production

The frequency of verb use in an utterance was found out by the total number of verbs in all verb-containing utterances, that is TNV(all)/ v-UTT, the ratio total number of verbs in all categories [TNV(all)] to the number of verb containing utterances (v-UTT).

Verb frequency was further explored in each verb subcategory in five variables. They were the total number of main verbs [TNV (main)], the total number of serial verbs [TNV (serial)], the total number of verb compounds [TNV (compound)], the total number of function verbs [TNV (function)] and the total number of modal verbs [TNV (modal)]. Let’s illustrate with an example, ngo5 sik1 zyu2 suk1mai‘ (I know how to cook corn) contains a modal verb sik1 (know) and a main verb zyu2 (cook) therefore adding one point for TNV (main) and one point for TNV (modal).

Five variables were used to address the production of verb diversity. They were the number of different main verbs [NDV (main)], the number of different serial verbs [NDV
(serial)], the number of different verb compounds [NDV (compound)], the number of different function verbs [NDV (function)] and the number of different modal verb [NDV (modal)]. The sentence given above adds only one point to NDV (modal) and one point to NDV (main) regardless how many times the same sentence was used in a sample.

Correlation analysis was done to find out the relationship between MLU and the total number of verbs [TNV (all)], as well as the relationship between MLU and the number of different verbs [NDV (all)] for the DS and the TD-LM groups. Similar as TNV (all) above, NDV (all) was defined as the total number of different verbs in all the five sub-categories.

Reliability measure

All the children in the DS group demonstrated a certain degree of speech problem for different reasons. To ensure that the transcripts were reasonably accurate for mis-articulated words, fifteen percent of each language sample in the DS group was re-transcribed by a final year student in Division of Speech and Hearing Sciences. The second transcriber was asked to transcribe all the child utterances back into the original transcript with only the adult utterances. This procedure was intended to provide context information for the second transcriber and to cut down on the time taken. Before transcription, the second transcriber was also allowed to view the video record of the language sample so that she could familiarize with the content of the conversation. Point-to-point reliability was obtained on word transcription and maze inclusion. Transcription reliability was 90%.

Result

Mean verb per verb-containing utterances (TNAV (all) / v-UTT)

Table 3 shows the mean and standard deviation of the total number of verb-containing utterances (v-UTT), the total number of verbs [TNAV(all)] and mean verb per verb-containing utterances (TNAV (all) / v-UTT) in the DS and the TD-LM groups. In a 100-utterance sample,
DS children used a verb in a similar percentage of their utterances as the TD-LM group (61.17% versus 63.83% respectively). This small discrepancy did, however, result in a group difference in the TNV (all)/ v-UTT ratio, that is the mean number of verbs per verb-containing utterances. The ratio for the TD-LM group was 1.07 verb and that for the DS group was 1.02 verb. In the two groups, they produced utterances with one verb and in very few occasions they use an addition verb, which is a modal verb or function verb. A T-test was analysis indicated the difference was significant (t = 2.170, p = 0.028).

This suggested that DS group used significantly fewer number of verbs in their verb-containing utterances then their language-matched peers (TD-LM).

Table 3

The mean (standard deviation) number of verb-containing utterance (v-UTT), mean total number of verbs TNV(all) and mean verb per verb-containing utterance TNV(all)/ v-UTT

<table>
<thead>
<tr>
<th></th>
<th>v-UTT</th>
<th>TNV (all)</th>
<th>TNV (all)/ v-UTT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS</td>
<td>61.67 (11.06)</td>
<td>62.83 (12.28)</td>
<td>1.02 (0.027)</td>
</tr>
<tr>
<td>TD-LM</td>
<td>63.83 (12.19)</td>
<td>69 (16.33)</td>
<td>1.07 (0.058)</td>
</tr>
</tbody>
</table>

Frequency of verb use—Total number of verbs (TNV)

Table 4 shows the mean and standard deviation of the number of verbs in each subcategory in the DS and the TD-LM group. Children in the TD-LM group used more main verbs, verb compounds and function verbs than in the DS group, while both groups used a comparable number of serial verbs and modal verbs. Five separate t-tests were performed to compare the groups in these variables. No significant group differences were found for TNV (Main), TNV (Serial), TNV (Compound) and TNV (Modal) (p > 0.05). However, the group difference for TNV (Function) was found to be approaching significant (t = 1.687, p =
0.0612). This suggested DS children used a comparable number of main verbs, serial verbs, verb compounds and modal verbs as their language-matched peers.

Table 4

The mean (standard deviation) of total number of verbs (TNV) of main verbs, serial verbs, verb compounds, function verbs and modal verbs.

<table>
<thead>
<tr>
<th>Variables</th>
<th>DS</th>
<th>TD-LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNV (Main)</td>
<td>43.17 (10.91)</td>
<td>47.5 (10.78)</td>
</tr>
<tr>
<td>TNV (Serial)</td>
<td>3.50 (3.91)</td>
<td>3.33 (2.50)</td>
</tr>
<tr>
<td>TNV (Compound)</td>
<td>4.17 (2.32)</td>
<td>5.17 (3.06)</td>
</tr>
<tr>
<td>TNV (Function)</td>
<td>5 (2.76)</td>
<td>8.5 (5.05)</td>
</tr>
<tr>
<td>TNV (Modal)</td>
<td>4.17 (2.71)</td>
<td>4.5 (3.89)</td>
</tr>
</tbody>
</table>

Diversity of verb use—Number of different verbs (NDV)

Table 5 shows the mean and the standard deviation of number of different verbs (NDV) in each subcategory in the DS group and the TD-LM group. Children in the TD-LM group used more different main verbs and function verbs than those in the DS group. On the other hand, the children in the DS group used more different serial verbs and modal verbs than those in the TD-LM group. However, the differences were small. Separate t-tests indicated that these group differences were not statistically significant. This suggested that the diversity of verb use was comparable in DS and TD-LM group.
Table 5

The mean (standard deviation) of NDV of main verbs, serial verbs, verb compounds, function verbs and modal verbs

<table>
<thead>
<tr>
<th>Variables</th>
<th>DS</th>
<th>TD-LM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDV (Main)</td>
<td>17.5 (5.05)</td>
<td>19.83 (4.67)</td>
</tr>
<tr>
<td>NDV (Serial)</td>
<td>3.50 (3.91)</td>
<td>3 (2.36)</td>
</tr>
<tr>
<td>NDV (Compound)</td>
<td>3.67 (2.42)</td>
<td>3.67 (2.07)</td>
</tr>
<tr>
<td>NDV (Function)</td>
<td>2.33 (1.03)</td>
<td>2.67 (1.03)</td>
</tr>
<tr>
<td>NDV (Modal)</td>
<td>2.33 (0.82)</td>
<td>2.17 (2.48)</td>
</tr>
</tbody>
</table>

**Relationship of Mean length of utterance (MLU) with total number of verb and verb diversity**

Pearson’s r correlations were computed separately for the Down Syndrome group and the TD-LM group on the relationship between MLU and total number of verbs TNV (all), and the relationship between MLU and verb diversity NDV (all). For TNV (all), a significant positive correlation with MLU was found in the TD-LM group (r =0.843, p<0.05) but not in DS group (r =0.662, p>0.1). For verb diversity [NDV (all)], a significant positive correlation with MLU was found in both the TD-LM group (r =0.882, p<0.05) and the DS group (r =0.973, p<0.005).

**Summary of findings**

1. Children in the TD-LM group used verb in a higher percentage of their verb-containing utterances than the children in the DS group.

2. Children in the DS group showed a linear relation between MLU and verb diversity [NDV (all)] but not between MLU and the total number of verbs [TNV (all)], while
children in the TD group showed a linear relation between MLU and the total number of verb [TNV(all)] and between MLU and verb diversity [NDV(all)].

Although the results were not statistically significant, the following trends were noted.

1. Children in the TD-LM group used more number of function verbs than children in the DS group.

2. Children in the DS group used comparable number of main verbs, serial verbs, verb compounds and modal verbs as children in the TD-LM group.

3. Children in the DS group used comparable diverse set of verbs as children in the TD-LM group.

Discussion

This study examined whether children with Down syndrome (DS) exhibit production deficit on verbs when compared with the typically-developing (TD-LM) children at the same level of language development indicated by MLU. Results from this study are discussed below.

*Mean number of verbs per verb-containing utterances (TNV (all) / v-Utt)*

DS children use fewer verbs in their verb-containing utterances than their language-matched peers (TD-LM). This result was consistent with Hesketh & Chapman (1998)’s study, in which DS children were found to produce fewer grammatical and lexical verbs per utterances. Hesketh & Chapman (1998) suggested that this was because DS children did not use a verb in some of their sentences. In this study, the mean number of verbs were calculated only on verb-containing utterances. There was a different reason for this finding in this study.

If an utterance contains more than one verb, it is either a complex sentence, or a sentence with a main verb and a modal or function verb. Review of the language samples indicated absence of complex sentences, which was reasonable in this MLU range. The larger value in
TD-LM group’s ratio is likely a result of the use of a modal verb or function verb with a main verb. Results in this study showed an approaching significant result on reduced number of DS children’s production of function verbs would give support to this claim.

*Frequency of verb use*

DS children used a similar number of main verbs, serial verbs, verb compounds, function verbs and modal verbs as their language-matched peers in their 100-utterance samples. This conclusion was consistent with Grela (2002)’s study. Miller (1991) suggested that the total number of words (TNW) represent ‘an index of general language facility’. When this measure is used for one grammatical word class (i.e. verbs), TNV might be viewed as the ease to use verbs in production. Thus it suggested that DS children were comparable to TD-LM in their ability to use verbs for sentence construction. This could be explained by the matching criteria. As both groups were matched on syntactic development, as indicated by their MLU. Most of them used simple utterances containing one verb only.

However, one thing had to be addressed on DS’s production of function verbs. They showed a trend in use fewer number of function verbs than their language-matched peers. However, DS group demonstrated a comparable diversity of function verb types as the TD-LM group. This suggested that they were able to acquire the knowledge (semantic representation of functions verbs) through bootstrapping strategy. However, the reduced number of function verb tokens could be due their difficulty in constructing sentences using function verbs. According to Luke & Nancarrow (1998), function verbs *jau5* (have), *hai6* (is) can use as auxiliaries, which have grammatical function of verb phrase (VP) modifiers. This was consistent with the finding that DS children produced fewer number of verbs per verb-containing utterances. Therefore, it might imply DS children’s deficit on syntactic knowledge and this suggested that their problem was more evidence in constructing a syntactically more complex sentence (e.g. with auxiliaries to modify VP).
Diversity of verb use

The diversity of verb use was comparable in DS and TD-LM groups. The result contrasted with the previous finding that DS produced more lexical verb types (Grela, 2002; Hesketh & Chapman, 1998). Age differences between groups and the method of language sample collection could be account for the difference.

First, the age difference between the DS and TD-LM groups was much smaller in the present study. In Hesketh & Chapman (1998), children in the DS group were on average 12 years older than those in the TD-LM group and in Grela (2002) DS were on average 8 years older than TD-LM children. However, in this study, the DS group were just on average 5.5 years older than TD-LM group. Hesketh & Chapman (1998) and Grela (2002) proposed that the increased lexical diversity in DS could be mainly due to their increased world knowledge and experience. Study on lexical diversity of children with specific language impairment (SLI) also supported the effect of age difference between groups on measures of lexical diversity. Owen & Leonard (2002) found that statistical significant difference between SLI and their LM peers was found in the group with the lowest MLU, but not the other 2 groups whose the MLU were higher. They found that the age difference between SLI and their LM peers in the lowest MLU group was largest (SLI was on average 24 months older while for the other groups, SLI were on average 18 months older). Owen & Leonard (2002) thus concluded that larger developmental (age) differences would lead to a larger difference of world knowledge which in turns affected lexical diversity. In this study, at similar MLU levels, children in the DS group were younger than those in Hesketh & Chapman (1998)'s and Grela (2002)'s studies. Thus because of the smaller group age gap, differences on lexical diversity was reduced in this study.

Another plausible explanation of the finding was differences in the method of language sample collection. Hesketh & Chapman (1998) used a retelling task of one's favourite movie,
story and personal event or to describe picture. A 3-year-old child who has difficulty with the
narrative genre would likely to use fewer verb types. On Grela (2002)'s study, language
samples were obtained from parent-child interaction during free play at home. It had to be
noted that the context of free play was not controlled which might also lead bias. As DS
children were older, and with more world experience, they might have more elaborate play
schemas, resulting in more verb types in their samples. However, in this study, the context
was controlled by a standard set of toys that were related with daily routines (i.e. sleeping,
bathing, dressing and eating). Thus it could be confident that even the youngest child in this
study would be familiar with the context. Therefore, after controlling the level of familiarity
of the context for language sample collect, the DS and TD-LM groups showed no difference
on the verb diversity. Finally, the comparable performance on verb diversity of the DS group
and the TD group suggested that DS children might have similar knowledge on verb as
typically developing children matched with MLU. Verb being one of the major grammatical
classes of word, this suggested that for younger children with DS, they have a smaller
semantic –syntactic gap.

Relationship of Mean length of utterance (MLU) with verb frequency and diversity

DS children showed no significant correlation with between MLU and the total number of
verbs [TNV(all)] This suggested DS children's use of verbs does not have a linear
relationship with their MLU in a 100-utterance sample. DS children had the knowledge of
verb, however, large individual variation within the DS group on the ease of using verbs
would be account for the differences.

Both DS and TD-LM group demonstrated correlation with MLU and the verb diversity.
This suggested, like TD-LM children, DS children’s verb knowledge increased as their MLU
increased. Though it was reported that children with DS showed asynchrony between
syntactic and semantic knowledge, the result showed no evidence about this claim. As the
mean age of DS children was higher than pervious studies (Grela 2002 & Hesketh & Chapman, 1998). This supported Gerla (2002)’s claim that DS children demonstrated larger syntactic-semantic gap as age increased.

Although the positive relationship between MLU and TNW, and between MLU and NDW (Miller, 1991), there was no previous study on the relationship between MLU and TNV, and between MLU and NDV. Therefore, it is reminded that the interpretation on the relationship between MLU with TNV and NDV was still at a preliminary stage. Further study on this area was needed to confirm the findings and investigate the underlying reasons.

*Individual analysis*

Although group results did not find that children with DS had a specific deficit on verb diversity when they were compared with their language-matched peers, individual language samples showed potential deficits on semantic knowledge. Grela (2002) reminded us that, though DS children showed a higher lexical diversity in his study, a rigid semantic representation of verbs could be a potential underlying reason for his findings.

In this study, on the other hand, a different finding was observed. Children with DS were found to overextend the meaning and the use of certain verbs. One of the DS children, YL, used a verb *jung6* (use) extensively. Of the 49 main verb tokens produced, 14 of them were the verb *jung6*. Apart from the original meaning of this verb, he used it to mean *zoek3* (wear). For example, when referring to an action of ‘putting his arm through the sleeve’, he said *jung6 neil go3* (use this one); and when he was holding a bowl of rice for request (for food or to indicate cooking), he said *jung6 fan6* (use rice). However, YL did have the three verbs (wear, cook and eat) needed for those occasions, as they appeared elsewhere in his language sample. Another DS child, HT, overextend the verb *sei2* (die). From her language sample, she said *sei2 zo2* (died) 10 times out of 52 tokens of lexical verb. In nine of these occasions, she said *sei2* with perfective aspektual marker *sei2 zo2*, and once she said *sei2 laal* (with
sentence final particle). One obvious example was that when she could not twist the hand of
the doll, she said *sou2 sei2 zo2* (hand died). In addition, HT consistently overextend the verb
compound *lou1 lyun6* (mix messy) to describe the action ‘making hair messy’. Overextension
of verbs was not found in all of the children in the DS group. This pointed out that the
individual differences of DS children do exist. A larger sample size was needed to draw
conclusion.

Limitation

First, the size of the two groups was small (N=6). And there is much variability in their
language level as indicated by wide range of MLU in both groups (between 1.9 to 3.7). This
increased variability within group, which might result in the failure to find any significant
differences on measures. For the variable in which significant result was found (e.g. for the
correlation between verb token and MLU), small group size might reduce its power to make
inference to the whole population.

Second, in this study, there was no information on the cognitive abilities of those children
(e.g. scores on verbal and non-verbal intelligence test) It was not able to evaluate the effect of
cognitive development on the learning the use of verbs. As mentioned before, cognitive
ability would affect semantic development. It was not possible to rule out mental age would
be one of the confounding factors for the results.

Clinical implications

*Assessment and Diagnosis.* Language samples obtained in naturalistic contexts provide
detailed information on one’s language system (e.g. syntactic knowledge, lexical
development), an important tool for the assessment of children’s language skills. However,
we should be aware of the discourse styles in obtaining language samples. This study
discovered that a poor discourse style (e.g. too many questions) would seriously
underestimate a child’s MLU. For example, in one language sample from the TD-LM group,
only 98 out of the 212 utterances remained after utterance exclusion, changing the child’s MLU from 2.60 to 3.89. In this sample, a large number of the child’s utterances were are word responses to the investigator’s A-not-A, Yes-No questions and wh-questions that require a minimal one word response.

Although semantics was repeated to be a relative strength for DS children, this study did not reveal that DS were more advance in semantic knowledge than their with language matched-peers. Therefore, in an assessment protocol for DS children, apart from focusing on syntactic skills, semantic skills also have to be assessed.

*Treatment.* This study suggested that treatment on this population should not only focus on syntax (e.g. increasing the syntactic complexity). Rather, a focus on semantics (e.g. increasing the variety of verbs) should also be considered. DS children have a slower rate of semantic development as keeping make progress in their cognitive development (Cardoso-Martins et. al, 1985; Miller, 1999). Thus, providing multiple exemplars for a particular syntactic frame could be helpful for them to learn new verbs (Naigles, 1996; cited in Grela, 2002). Repeated exposure of verbs under different syntactic frames could also enhance morphosyntactical development (Grela, 2002). For example, when teaching the use of a modal verb *ho2ji5* using questions or sentences of different syntactic frames

*Directions for Future Research*

In addition to use a larger sample of children, further studies could include other grammatical word classes (e.g. noun, post-verbal modifier) to further investigate the nature of semantic development in children with Down syndrome.

Experimental tasks could be designed to examine children’s use of verb knowledge, given evidence of over-extension identified in this study.
Acknowledgement

I would like to express my greatest thanks to my supervisor, Dr. Anita Wong for her valuable advice and kind guidance throughout the study. I was especially grateful for her constant encouragement and support. Special thanks go to Professor Paul Fletcher for his co-supervision. In addition, I would like to thank Ms Sandra Ng and Ms S.K. Hung from The Hong Kong Down Syndrome Association for their support. Finally, many thanks to the participants and their parents for their time contribution to my study.

References


Pro


Appendix A

The list of standardized set of toys

<table>
<thead>
<tr>
<th>Daily Routine</th>
<th>Toys used</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>A baby</td>
</tr>
<tr>
<td>Bathing</td>
<td>A washbasin</td>
</tr>
<tr>
<td></td>
<td>A piece of cloth (towel)</td>
</tr>
<tr>
<td></td>
<td>A small bottle of shampoo</td>
</tr>
<tr>
<td></td>
<td>A piece of soap</td>
</tr>
<tr>
<td></td>
<td>A bottle of baby power</td>
</tr>
<tr>
<td>Dressing</td>
<td>A comb</td>
</tr>
<tr>
<td></td>
<td>A detachable clothes</td>
</tr>
<tr>
<td></td>
<td>A diaper</td>
</tr>
<tr>
<td></td>
<td>A pair of socks</td>
</tr>
<tr>
<td>Eating</td>
<td>A baby bib</td>
</tr>
<tr>
<td></td>
<td><em>Cook set with utensils</em></td>
</tr>
<tr>
<td></td>
<td>A frying pan, a teapot, a bowl, 2 cups, a plate, a bowl, 2 knives, a spoon, a fork, a pair of chopsticks</td>
</tr>
<tr>
<td></td>
<td><em>Food</em></td>
</tr>
<tr>
<td></td>
<td>A milk bottle, a piece of sandwich, a piece of bread, an egg, some rice, a chicken, a melon, a carrot, an apple, a banana</td>
</tr>
<tr>
<td>Sleeping</td>
<td>A cloth (blanket)</td>
</tr>
<tr>
<td></td>
<td>A pillow</td>
</tr>
</tbody>
</table>
Appendix B


<table>
<thead>
<tr>
<th>Core member</th>
<th>Meaning</th>
</tr>
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<tr>
<td>daa2syun3</td>
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</tr>
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<td>dare</td>
</tr>
<tr>
<td>hang2</td>
<td>willing to</td>
</tr>
<tr>
<td>ho2ji5</td>
<td>can</td>
</tr>
<tr>
<td>hou2</td>
<td>had better, should</td>
</tr>
<tr>
<td>jing1goi1</td>
<td>should</td>
</tr>
<tr>
<td>jyun6</td>
<td>be willing to</td>
</tr>
<tr>
<td>nang4gau3</td>
<td>can</td>
</tr>
<tr>
<td>wiu5</td>
<td>will, could, can</td>
</tr>
<tr>
<td>zik6dak1</td>
<td>worth</td>
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<table>
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<tr>
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<th>Meaning</th>
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<tbody>
<tr>
<td>bei2</td>
<td>may</td>
</tr>
<tr>
<td>jiu3</td>
<td>good enough to be</td>
</tr>
<tr>
<td>pui3</td>
<td>can</td>
</tr>
<tr>
<td>sik1</td>
<td>wish to</td>
</tr>
<tr>
<td>soeng2</td>
<td>must, want to</td>
</tr>
<tr>
<td>zeon2</td>
<td>may</td>
</tr>
<tr>
<td>zung1ji3</td>
<td>love, like</td>
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