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SHORT PAPER

Preliminary Study on Verb Acquisition Status and Related Factors in Children with Down Syndrome

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ABSTRACT

Conditions supporting the acquisition of verbs by children with Down syndrome were investigated from early childhood to lower grades of elementary school. Moreover, correlations between verb acquisition and parents' approaches to their children were analyzed. Participants were parents having children with Down syndrome that had acquired meaningful words (n=27). The "words and grammar" version of the Japanese MacArthur Bates Communicative Development Inventories (JCDIs) was administered to examine the parents' involvement. The results indicated that when the total number of expressed vocabularies exceeded 200, the rate of acquiring verbs increased even in children with Down syndrome, which indicated that "200 words" was an important criterion. Moreover, results suggested that reading and writing letters and numbers as well as teaching children the polite use of language used by parents supported verb acquisition by children with Down syndrome.

<Key-words>

down syndrome, verb, Japanese MacArthur Communicative Development Inventories (JCDIs)

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I. Introduction and objects

One characteristic of language development in children with Down Syndrome (DS) is a considerable delay in expressive language, compared to language comprehension and intellectual development (Ikeda, 1994b). Previous studies have indicated that DS children have particular difficulty in acquiring verbs among expressive language (Nagasaki, 1995; Loveall, Channell, Phillips et al., 2016; Michael, Ratner & Newman, 2012). However, few studies conducted in Japan have examined the acquisition of verbs in DS children in detail. Verbs are the core of sentences (Imai & Haryu, 2007). Therefore, it is important to investigate the characteristics of the acquisition of verbs in DS children to effectively support the language development of such children. Nagasaki (1995) examined the acquisition of vocabulary in four DS children, which indicated the need to examine the size of the vocabulary and verb acquisition limitations in DS children over three years of age. Children start to use the language they have acquired in daily life as their own words from early childhood to lower grades of elementary school (Okamoto, 1985). Therefore, it is important to examine the language development of DS children from early childhood to lower grades of elementary school. Moreover, DS children develop by receiving early medical treatment and education, home education, and school education (Ikeda, 1994a). Therefore, it is necessary to analyze the effect of parents' approaches to DS children's acquisition of verbs.

Based on the above factors, the present study examined conditions related to the verb acquisition in DS children from early childhood to lower grades of elementary school. Moreover, correlations between verb acquisition and parents' approaches to children were analyzed. This study is regarded as a preliminary study because the study sample is relatively small.

II. Methods

1. Participants

This study was designed to investigate expressive language. Participants were parents (n=27) of DS children (15 boys and 12 girls) between three and nine years of age, the period when meaningful words appear in children's language. The 27 children included 14 preschool children (3~6 years old), and 13 elementary school children (6~9 years of age).

2. Survey content

1) Survey on verb acquisition

We investigated verb acquisition by using "Words and Grammar" (Watamaki & Ogura, 2004) in the Japanese MacArthur Communicative Development Inventories (JCDIs), which has been used in previous studies. These studies included an examination of the

composition of vocabulary in early childhood (Ogura, 2007), and a study on the acquisition of vocabulary (Iwasaki & Azegami, 2018). The “Words and Grammar” is composed of Part 1: “Words” and Part 2: “Sentences and Grammar” and each part consists of question items. Part 1: “Words” is composed of “(I). Expressive vocabulary” that includes 711 items and “(II) Ways of using words” that includes 5 items. “(I). Expressive vocabulary” includes 103 motion words, which were used in the present study to indicate verb acquisition. Part 2: “Sentences and Grammar” is composed of “A: Connections (postpositional particles and auxiliary verbs),” “B: Postpositional particles,” “C: Auxiliary verbs,” “D: Collocation utterance,” “E: The maximum length of a sentence (the number of morphemes of the three longest utterances),” and “F: The complexity of a sentence.”

The scores of “(I). Expressive vocabulary” (total score = 711), “B: Postpositional particles” (total score=25), “C: Auxiliary verbs” (total score=30), and “F: The complexity of a sentence” (total score=37), and the mean scores and standard deviations were calculated. “(I). Expressive vocabulary” included 24 sub-categories and each mean percentage of scores was calculated. The mean of the number of morphemes among three sentences written by a respondent was calculated as the “E: The maximum length of a sentence”.

2) Survey on parents' involvement

The content of the survey on parents' involvement with children included children's profiles, parents' approaches to children, and speaking to children. Ten items were used to examine parents' approaches to children, among which 8 items were extracted from the items of “Early approaches” developed by Fujinaga, Shinagawa, Watanabe et al. (2005), and 2 items were developed based on a pilot survey. The items were scored using a four-point scale; “Always (every day) =4,” “Often (once in 2-3 days) =3,” “Sometimes (once a week) =2,” and “Rarely (once a month) =1.” Moreover, the children's gender, chronological age, affiliation, certificate of the degree of intellectual disabilities, and the presence of complications, among others, were inquired as to the children's profiles.

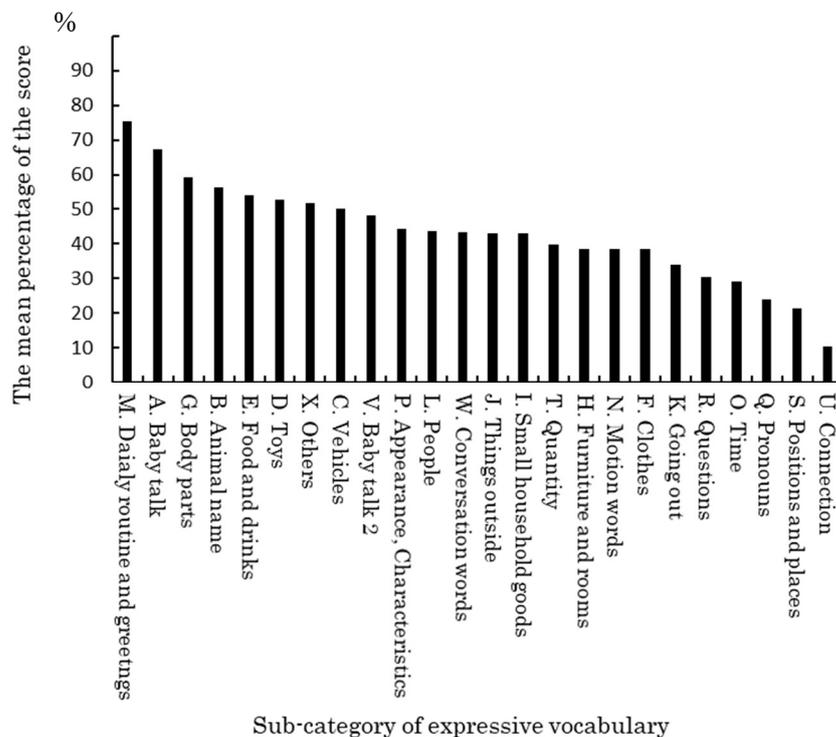
3) Ethical considerations

The questionnaire was administered anonymously. Written explanations were provided to the participants about the following issues. They were informed that they could stop responding to any question they cannot answer or do not want to answer and that they would not face any disadvantage by refusing to respond. They were also told that the survey results would only be used for the research purposes and personal information would not be published in their original form. It was regarded that participants gave their consent to participate in the survey if they responded to the questionnaire. The protection of private information was carefully considered so as not to identify any individuals.

At the time of analysis, the results of JSDIs and the questionnaire were coded in lowercase alphabet so that the personal information would match.

III. Results

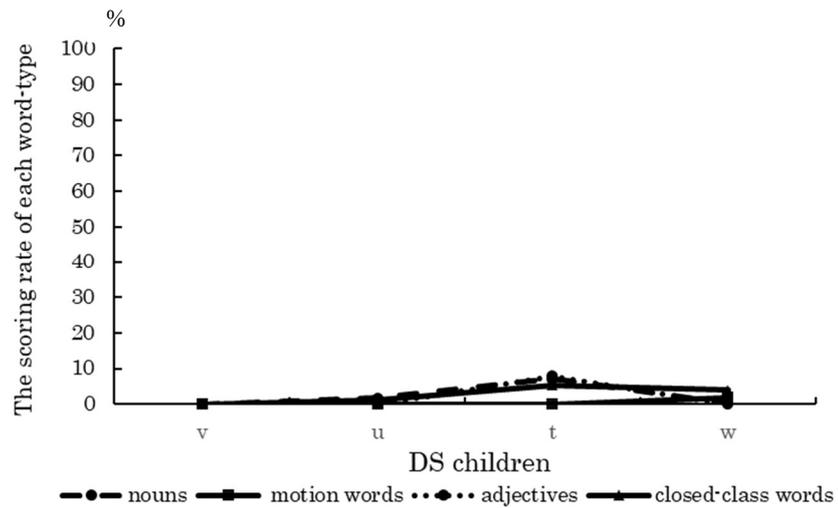
The mean percentage of the score for each sub-category of “(I. Expressive vocabulary” of the 27 respondents are shown in descending order in Figure 1. The mean percentage of scores for all the sub-categories was 45.8% and that for “N. Motion words” was 38.4%, which was ranked 17th among 24 sub-categories.



<Figure 1> The mean scoring rate of each sub-category of expressive vocabulary

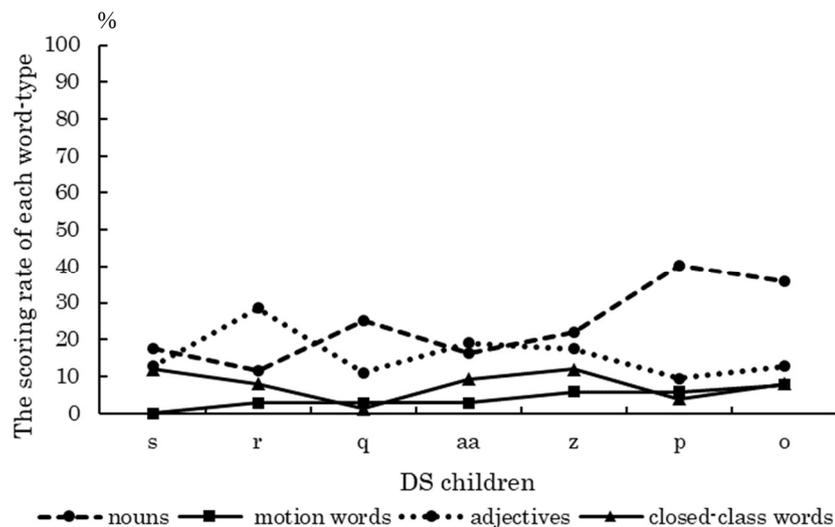
We examined the correlation between the number of expressive vocabulary words and the composition of vocabulary by referring to a previous study (Ogura, 2007). The 281 expressive vocabulary words in the following subcategories were classified into nouns; “B. Names of animals,” “C. Vehicles,” “D. Toys,” “E. Food and drinks,” “F. Clothes,” “G. Body parts,” “H. Furniture and rooms,” and “I. Small household goods.” The 103 words included in “N. Motion words” were regarded as verbs. 63 words included in “P. Appearance/characteristics” were adjectives. 75 words included in “Q. Pronouns,” “R. Questions,” “S. Positions and places,” and “T. Quantity” were regarded as closed-class words. Based on the number of words in the above four word-types and children’s scores, the percentage of the score for each word-type in DS children was calculated. Moreover, children were classified based on the number of expressive vocabulary words, and the correlation between the number of expressive vocabulary words and the composition of vocabulary was examined, which indicated the following; four children had 0~100

expressive vocabulary words, seven children had 101-200, six children had 201-400, five children had 401~600, and five children had more than 601 expressive vocabulary words. Figure 2-1~ Figure 2-5 indicate the percentage of the score for each word-type based on the number of expressive vocabulary words of DS children. In addition, the lowercase alphabets on the horizontal axis in Figure 2-1 to Figure 2-5 represent codes of each child with DS.



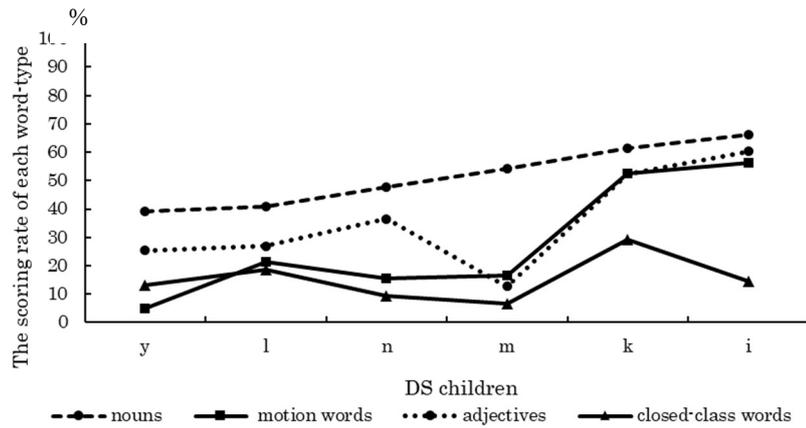
<Figure 2-1>

The scoring rate of each word-type in children with 1~100 expressive vocabulary words
The lowercase alphabets on the horizontal axis represent codes of each child with DS.



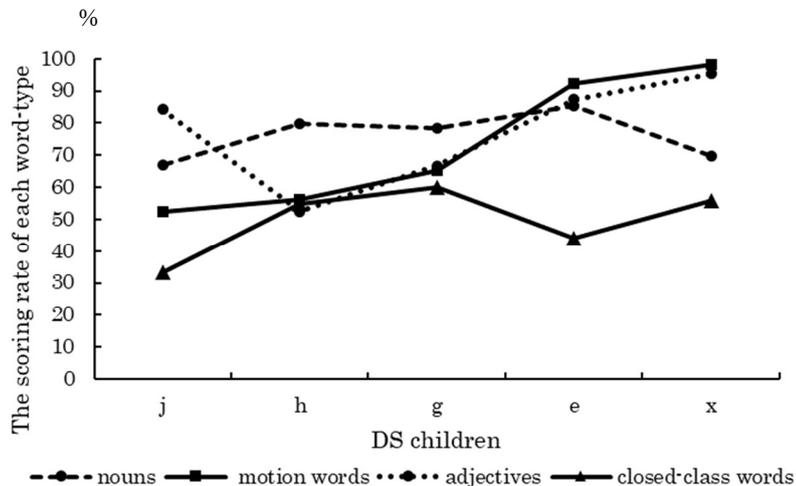
<Figure 2-2>

The scoring rate of each word-type in children with 101~200 expressive vocabulary words
The lowercase alphabets on the horizontal axis represent codes of each child with DS.



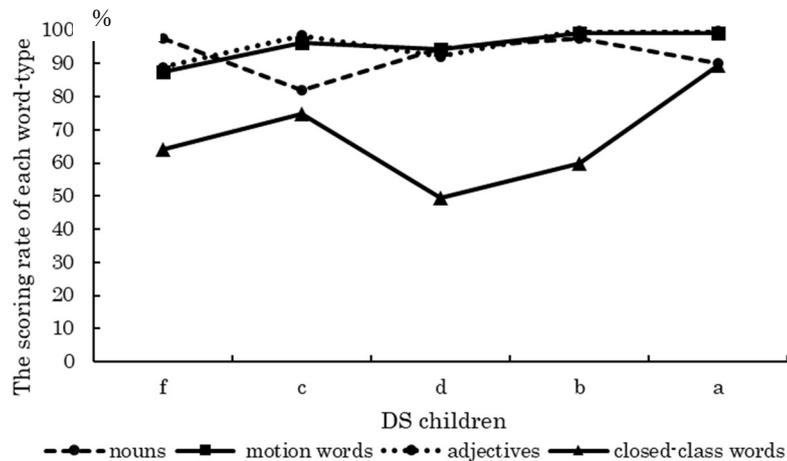
<Figure 2-3>

The scoring rate of each word-type in children with 201~400 expressive vocabulary words
The lowercase alphabets on the horizontal axis represent codes of each child with DS.



<Figure 2-4>

The scoring rate of each word-type in children with 401~600 expressive vocabulary words
The lowercase alphabets on the horizontal axis represent codes of each child with DS.



<Figure 2-5>

The scoring rate of each word-type in children with 601~711 expressive vocabulary words
The lowercase alphabets on the horizontal axis represent codes of each child with DS.

Correlations between motion words and postpositional particles, auxiliary verbs, the maximum length of a sentence, as well as the complexity of a sentence were examined by calculating the Spearman's rank correlation coefficient, which indicated significant positive correlations with postpositional particles ($r=.876, p<.01$), with auxiliary verbs ($r=.880, p<.01$), with the maximum length of a sentence ($r=.712, p<.01$), and with the complexity of a sentence ($r=.677, p<.01$).

Correlations between the motion word score and chronological age, as well as the degree of certified intellectual disabilities, were examined by calculating Spearman's rank correlation coefficients. Five children with intellectual disability levels that could not be classified into the four certification levels were excluded from the analysis, and the rest were classified into preschool children ($n=10$) and elementary school children ($n=12$). The results indicated a significant positive correlation between motion word score and chronological age in preschool children ($r=.662, p<.05$). On the other hand, the correlation between the motion word score and the degree of certified intellectual disabilities was not significant ($r=.386, p>.05$). Moreover, a significant correlation was not indicated between the motion word score and the degree of the certified intellectual disabilities in elementary school children, ($r=.385, p>.05$) or between the motion word score and chronological age ($r=.438, p>.05$).

<Table 1> Rank correlation coefficients between the items of JCDIs and the items related to parents' approaches to children

Parents' approaches to children	Items of "words and grammar" in JCDIs					
	Motion words (n=22)	Expressive vocabulary (n=22)	Postpositional particles (n=22)	Auxiliary verbs (n=22)	The maximum length of a sentence (n=15)	The complexity of a sentence (n=18)
Making children listen to songs or music	.288	.295	.059	.077	.111	.084
Reading books to children	.364	.350	.097	.148	-.104	.234
Showing TV or videos to children	.241	.240	.179	.053	-.250	-.102
Putting a child in a children's group	-.434*	-.445*	-.448*	-.455*	-.309	-.242
Giving a chance for children to interact with adults other than family members	-.360	-.352	-.495*	-.416	-.231	-.051
Teaching the name of persons and things	.074	.043	.024	.002	.325	.221
Reading and writing letters	.571**	.519*	.576*	.590*	.330	.173
Reading and writing numerals	.480*	.430*	.506*	.545*	.497	.379
Using picture cards at home	-.178	-.260	-.386	-.373	.084	-.150
Using the applications of electronics such as tablet-type devices together with children or making children use them	.234	.268	.212	.238	-.249	-.181

** $p < .01$ * $p < .05$

Furthermore, Spearman's rank correlation coefficient was calculated between motion word scores and items assessing "parents' approaches to children" as well as "speaking to children" after excluding participants that did not respond or had missing values. Table 1 shows the correlations between motion word scores and approaches to children. A

significant mid-level positive correlation ($r=.571, p<.01$) was indicated between motion words and “reading or writing letters” and a significant mid-level positive correlation ($r=.480, p<.05$) was indicated between motion words and “reading and writing numerals.” Table 2 shows the correlations between motion words and speaking to children. A significant mid-level positive correlation ($r=.421, p<.05$) was indicated between motion words and “teaching polite language.”

<Table 2> Rank correlation coefficients between the items of JCDIs and the items related to speaking to children

Speaking to children	Items of "words and grammar" in JCDIs					
	Motion words (n=26)	Expressive vocabulary (n=26)	Postpositional particles (n=26)	Auxiliary verbs (n=26)	The maximum length of a sentence (n=15)	The complexity of a sentence (n=19)
Asking the names of things	.271	.301	.117	.077	.247	-.011
Teaching the names of things	-.058	-.038	-.194	-.229	.017	.016
Giving an example of the ways of speaking when a child is at a loss for a word	.215	.226	.192	.093	-.010	-.140
Making questions to develop conversations	-.085	-.095	-.089	-.168	.092	.136
When children make a mistake when speaking, teaching them correct expressions	.144	.164	.096	-.006	.137	-.025
Talking about what parents experienced	-.110	-.120	-.227	-.292	.081	-.069
Talking about parents' feelings and impressions	-.071	-.087	-.102	-.155	.206	.132
Teaching polite language	.421*	.472*	.406*	.313	.295	.112

* $p < .05$

IV. Discussion

The mean percentage of the score for “M. Daily routine and greetings” was the highest among the 24 sub-categories of expressive vocabulary, followed by “A. Baby talk,” “G. Body parts,” “B. Names of animals,” “E. Food and drinks,” and “D. Toys,” in descending order. The mean percentage of the score for “N. Motion words” was 38.4%, which ranked 17th among 24 sub-categories. It has been demonstrated that children acquire words related to a person, food, vehicles, body parts, and greetings in the early stage of development (Kobayashi, 2008). The words that are easily acquired by DS children are considered to be similar to typically developing (TD) children. Conjunctions among the parts of speech are used by TD children at last (Okubo, 1967). In the present study, the mean percentage of the score for “U. Connection” was the lowest among expressive vocabulary words. Easily acquired words as well as words with a delayed acquisition may be similar in DS and TD children.

Moreover, we examined the differences in the percentage of the score for each word-type depending on the number of acquired expressive vocabulary words by referring to Ogura (2007). The results indicated that the percentage of the score for motion words of children with 1~100 expressive vocabulary words was 0% or nearly 0%, whereas the rate of 0% was less in children with 101-200 expressive vocabulary words. In some children, the percentage of the score for motion words was higher than that for closed-class words. Only one child among children with over 201 expressive vocabulary words had the lowest ranking for the motion word score in the four word-types. Children with over 600 expressive vocabulary words did not show significant differences among the scores for nouns, verbs, and adjectives, and had a percentage of the score of over 85. The increase in the rank of the percentage of motion word scores among the four types of words is consistent with Ogura (2007) who also examined TD children. It has been indicated that the percentage of the names of general things increases most rapidly in TD children when the number of excessive vocabulary words is 50~100, which keeps increasing until 200 words, whereas the percentage of nouns starts to decrease when exceeding 200 words (Kobayashi, 2008). Therefore, it is considered that the verb acquisition rate of DS children would also increase when the number of expressive vocabulary words exceeds 200. Therefore “200 words” is regarded as a criterion.

We also investigated the correlations between motion words and “Postpositional particles,” “Auxiliary verbs,” “The maximum length of a sentence,” and “The complexity of a sentence” in JCDIs. It was indicated children with higher motion word scores had higher scores for the other items as well. Moreover, a strong correlation was shown between motion words and postpositional particles, auxiliary verbs, the maximum length of a sentence, and the complexity of a sentence. Verbs have the role of making the basic structure of a sentence (Morikawa, 2017). Therefore, there might have been a strong correlation between motion words and each grammatical item.

We also examined the correlations between motion words and chronological age as well as the degree of the certified level of intellectual disabilities, which indicated a strong correlation with the chronological age of preschool children. It is suggested that preschool children acquire motion words as the chronological age increases. On the other hand, the correlations with both chronological age and the certified level of intellectual disabilities disappeared in elementary school children. This could be because the effects of chronological age and the level of intellectual disabilities on the acquisition of motion words decrease in elementary school children.

Moreover, correlations between motion word scores and each “parents’ approaches to children” and “speaking to children” item were examined, which indicated a strong correlation between motion words and “reading and writing letters”, and a mid-level correlation between motions words and “reading and writing numerals.” It is considered that verbs are acquired by reading and writing letters and numerals. Regarding “speaking to children,” a mid-level correlation was identified between motion words and “teaching

polite language.” Otomo et al. (2005) examined language development in TD children from early childhood to childhood and suggested “teaching polite language” might provide new perspectives and expression methods to children, which were not previously in the children’s repertory. The results of the present study suggest that parents’ approaches to DS children, i.e., teaching polite language, might increase expressive vocabulary words.

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