Input Frequency and Case Acquisition in Japanese

Susanne MIYATA

The present article investigates the acquisition of case structure in Japanese within the frame of Tomasello's Usage-Based Theory. We expected a strong correspondence between the case particle use vs. drop for individual verbs used by the mother and her child (frequency effect), and - due to different communicative goals - a less strong correspondence in the percentage of realized arguments (pragmatic effect). Our results based on the analysis of longitudinal observational data (mother-child conversations) of a boy aged 1;10 - 3;1, showed a rather strong congruence between him and his mother with some pragmatic effects in both argument and particle use.

Keywords: Case Particle, Argument Structure, Japanese, Language Acquisition, Input

1. Introduction

Japanese, as a null-argument language, allows the drop of case particles as well as of whole arguments. Due to discourse-pragmatic reasons, the rate of case particle drop in spoken language varies largely (Fujii & Ono, 2000). Aida (1993), who investigated the speech of six Japanese women speaking to other adults, found that the omission rates varied from 0% for the case particles *kara* 'from' (originalis) and *made* 'to' (directionalis), and 1% for the genitive *no,* to 26% for the nominative *ga* and even 65% for the accusative *o*. The omission rates rose considerably when the same women talked to their pre-syntactic infants; although *kara* and *made* were never omitted (0%), the omissions of the genitive particle *no* increased to 10%, of the nominative *ga* to 54%, and of the accusative *o* to 99%.

Similarly, Rispoli (1995) found that only 9% of the 226 transitive sentences he had analyzed included an overt object marking with *o,* 7% contained a subject marking with *o*, and 1% contained both *ga* and *o*. On the other hand 54% contained unmarked arguments, and 32% consisted only of a verb. He concludes that the infant's case system is acquired rather late, "perhaps as late as five years old" (Rispoli, 1995:345), and they instead rely on semantic cues like animacy and word order.

Experimental comprehension studies report contradictory results. Hayashibe, (1975, cited after Rispoli, 1979) showed that for 3- to 5 year-old children, animacy would override the case particles *ga* (nominative) and *o* (accusative) in transitive sentences. Also Iwatate's (1980) and Iwasaki's (2007) results suggest that 2- to 3-year-olds tend to interpret the noun phrase in transitive verb sentences as the agent regardless of the case marker used. Ito, Tahara & Park (1991) reported comprehension errors for children up to the 5th grade. In an elicitation study Suzuki (2000) found a high error rate especially for transitive verbs (47% with 3-4 year-olds and 28% with 5-6 year-olds). On the other hand, Otsu (1994) reports that 3- to 4-year-olds interpreted the noun phrase in these sentences correctly as the subject, if the phrase was marked with the nominative case particle *ga* (NP *ga*), or as the object if marked as accusative (NP *o*) or the case particle was dropped (NPØ).

2. Early production of case particles

Despite the high omission rates of at least some of the particles, case particles start to be used "early and without much apparent difficulty" (Clancy, 1985). Matsuoka (1998) likewise reports a "rapid, error free acquisition," which she assumes to be evidence of an innate knowledge of case. Kuriyama (2001) reports early productivity (measured as 4 tokens in different verb and noun contexts): *ga* (nominative), *ni* (directionalis) and *de* (locative) appeared around MLUm 2.0 and *to* 'and' and *kara* 'from' around MLUm 2.5 with the actual age varying between 1;10 and 2;9 depending on the overall developmental speed of the individual child. Even the accusative case particle *o*, the most infrequent marker, could be produced surprisingly early (between 2;0 and 2;9).

Morikawa (1997), who analyzed the extensive diary data of Noji (1974-1977), found that the child had acquired case relations for transitive and intransitive verbs by age three. Errors were infrequent, and the child's pattern of use corresponded to the parental input where it was consistent: nominative subjects of non-stative transitive verbs (e.g.: NOM *ga* ACC *o miru* 'see') and objects of stative transitive verbs (e.g.: NOM *ga* *wakaru* 'understand') were frequently realized with the case particle, while the accusative particle *o* (e.g.: NOM *ga* ACC *o* *miru* 'see') which was omitted by his parents in half of the cases, was used only infrequently.

3. A usage-based approach to case acquisition

The idea behind these approaches is that children develop (or, depending on the point of view of the author, possess from the beginning) a concept or rule of case structure, detect the respective surface expressions specific to their language, and apply them in their actual sentences.

In the studies mentioned above, case and case particle acquisition has been researched in terms of percentage of realization over a number of verbs of the same syntactic type (e.g. transitive verbs). But this pooling of different verbs might indeed blur the picture, and where detailed data is provided, differences between individual verbs are obvious (e.g.: Morikawa, 1997). As Ninio (2006) points out, each verb is used for different communicative goals, so the proportion of arguments realized differs also for verbs with the same valency structure. For example, in the case of the transitive verb *tsukuru* 'make', the information of the object to be constructed may appear relevant to the speaker, while for *kowasu* 'break' the information of the agent, namely the one who breaks, might be of more interest. This pragmatic difference has an effect on the proportion of agents and objects, expressed as argument, resulting in different percentages for each verb. Furthermore, the perspective and communicative goals may be different for mothers and children, again resulting in a different percentage of arguments. A mother might want to make clear who broke a toy (increased percentage of agents expressed), a point in which the child might not be so interested. An approach which pools the percentage of arguments over a number of verbs nullifies this difference.

Tomasello (1992, 2003) suggests that children's acquisition of argument structure starts on a verb to verb basis (the so-called Verb-Island Hypothesis). Each of these verb islands possesses one or more sentence-frames and preferred morphological markings. Even semantically close verbs do not share sentence frames or morphology. These isolated item-based constructions are used for a rather long time, and connections to other verbs with similar constructions are drawn relatively late; around age three or later (Tomasello, 2003:141).

Ninio (2006), in an intriguing attempt to conciliate UG (universal grammar) with a usage-based approach, claims that children begin to acquire grammar by merging words in binary dependency relations. These dependency relations are acquired word by word according to the semantic and syntactic valences of the individual verb or adjective. In contrast to Tomasello, she assumes that analogy to semantically similar verbs plays a role from the very beginning and facilitates the learning of valency structure of new verbs.

Ninio further showed that when children learn verbs, they do not simply copy the distribution of verbs in the input.

Only 40% of the first verbs used by the children she observed belonged to the most frequent 10 verbs used by the mother (Ninio, 2006:140). This shows that distributional learning as proposed by Lieven, Pine & Baldwin (1987) might in fact be too one-dimensional because it neglects the different goals of mother and child. Ninio claims that children's choice of verbs is "free and well informed" (Ninio, 2006:127); they chose verbs primarily according to their communicative needs, and only secondarily according to input frequency.

If we apply Ninio's approach (that is, learning of valences on a verb by verb basis on the basis of maternal input and input frequency effects contingently overruled by communicative goals) to the acquisition of Japanese argument structure and case particles, we would expect a correspondence between the constructions of individual verbs used by the mothers and the way they are used by their children (input frequency effect). As the communicative goals are different for each verb, the percentage of realized arguments should differ between individual verbs and for verbs with an identical valency structure (pragmatic effect). Furthermore, as the goals can also differ between mothers and children, the frequency of the verb itself as well as the proportion of the arguments realized with this verb might differ between mothers and children. On the other hand, once an argument is used, we would expect a similar rate of realization of the case particle for this argument (at least after the phonological form has been acquired by the child) because the pragmatic effects on the realization or drop of a case particle should be small. The rate of particle drop for the child should therefore approach the rate of her mother (input frequency effect). In short we would expect that,

1. the proportion of arguments vs. argument drop is different for each verb regardless of an identical argument structure (pragmatic effect);
2. using the same verb, the proportion of arguments vs. argument drop may differ for mother and child (pragmatic effect eventually overruling input frequency effect);
3. using the same verb, the proportion of particles vs. particle drop is similar for mother and child (input frequency effect).

4. Data and method

We analyzed longitudinal speech data of a boy named Tai (age: 1;10 -3;1, MLU range 1.5 – 5.6) and his mother (Miyata, 2004; available at CHILDES database, MacWhinney, 2000). The whole corpus of 75 sessions was used for this analysis, resulting in a total of 34,533 utterances by Tai (below TAI) and 33,737 utterances by his mother (below MOT). First, we computed the verb frequency for TAI and MOT. We considered only main verbs and excluded uses of compound verbs (e.g.: we included *kuru* "come" but not *motte kuru* 'bring', lit.: 'take and come'). Out of TAI's 20 mostly used frequent verbs we chose the following seven verbs for our analysis: the stative transitive verb *motsu* 'hold', the non-stative transitive verbs *taberu* 'eat', *toru* 'take', and *tsukuru* 'make', and the intransitive verbs *hairu* 'enter', *iku* 'go', and *kuru* 'come'. The valences and the corresponding case particles realized with these verbs are the following: nominative (NOM; *ga*), accusative (ACC; *o*), locative (LOC; *ni*, *de*, *e*, *o*), originalis (ORIG; *kara*, *de*), directionalis (DIREC; *ni*, *e*, made), benefactive (BEN; *ni*), motive (MOT; V-*i ni*, VN *ni*), instrumentalis (INSTR; *de*) and symmetry (SYM; *to*). The analysis of obligatory and optional arguments follows Rickmeyer (1977). Free complements (e.g.: the locative complement *shokudoo de* as in *shokudoo de taberu* 'eat in the cafeteria'), occurring in child language are added (Table 1). Note that Japanese, as a null-argument language, allows the drop of not only optional but also obligatory arguments, under the condition that they can be understood from the context, even if they are not verbally realized (Rickmeyer, 1977).

Second, we extracted all sentences containing these verbs and analyzed the use of case particles and arguments for each verb separately. In the category "argument" we included all arguments with or without a case particle, as well as deviant case particle use, and topicalized arguments (the nominative *ga* and the accusative *o* are suppressed when the

argument is topicalized). We excluded constructions with causative (V-*saseru*), passive (V-*rareru*), and potential (V-*reru*) verb inflections because these verb forms result in an alteration of the case structure. Similarly we excluded the use with compound verbs causing a case alternation (e.g.: a combination with the subsidiary verb *kuru* 'come' would result in an additional directionalis case, and suppress the instrumentalis case: NOM *ga* ACC *o* INSTR *de motsu* "hold something with something" would change to NOM *ga* ACC *o* DIREC *ni motte kuru* "bring something to somewhere", lit.: "take and come."). Also the use within a relative sentence was excluded (e.g.: *Taroo ga tabeta ichigo* 'the strawberries [which] Taroo has eaten') because the moving of one of the arguments to the head position would put this argument into a different case structure.

Table 1 Valency analysis of the seven verbs analyzed in this study

Argument Type / Verbs	Obligatory Arguments	Optional Arguments				Free Complements		
	NOM	ACC	ORIG	DIREC	MOT	INSTR	LOC	SYM
hairu 'enter'	*ga*	-	*kara*	*ni*	-	-	-	-
iku 'go'	*ga*	-	*kara*	*ni*	V-*i*/VN *ni*	*de*	-	*to*
kuru 'come'	*ga*	-	*kara*	*ni*	V-*i*/VN *ni*	*de*	-	*to*
motsu 'hold'	*ga*	*o*	-	*ni*	-	*de*	-	-
taberu 'eat'	*ga*	*o*	-	-	-	*de*	*de*	*to*
toru 'take'	*ga*	*o*	*kara*	-	-	*de*	*de*	-
tsukuru 'make'	*ga*	*o*	*kara/de*	*ni*	-	*de*	*de*	*to*

5. Results

We found 299 different verb stems with 10,947 tokens for TAI, and 354 stems with 11,308 tokens for his mother. For the detailed analysis of the seven verbs, we analyzed 1,877 verb constructions for MOT and 1,927 constructions for TAI, including a total of 401 (MOT) and 332 (TAI) case particles.

a) Verb Frequency

The most frequent verbs used by TAI were to a large degree identical to the most frequent verbs of MOT. Although the actual placement in the frequency list differed, the most frequent 14 verbs of TAI were all among the most frequent 20 verbs of MOT, and 85% (17 out 20) of his most frequent verbs belonged also to MOT's 20 frequent verbs. The frequency of individual verbs in relation to the overall number of utterances was very similar for TAI and MOT, although verb preferences appear to a certain degree. TAI used *hairu* 'enter' and *iku* 'go' slightly more frequently than did MOT, while she used *tsukuru* 'make' and *kuru* 'come' more often (Figure 1).

b) Overall Proportion of Arguments

The proportion of verbs with some kind of argument was rather high with an average of 52% for TAI, and 63% for MOT (Figure 2). There were considerable differences in usage between the individual verbs, though. While MOT realized *tsukuru* 'make', *motsu* 'hold' and *taberu* 'eat' mostly with arguments (72% to 82% with arguments), only half of her sentences with *hairu* 'enter', *iku* 'go' and *kuru* 'come' included an argument. For TAI the same tendencies could be seen for *tsukuru* 'make' (70% with arguments), and *motsu* 'hold' (60%); also *hairu* 'enter', *iku* 'go' and *kuru* 'come'(between 43% and 59% with arguments) showed a similar proportion of arguments like his mother. On the other hand, *taberu* 'eat' (38%) and especially *toru* 'take' (37%) were often

realized without any argument.

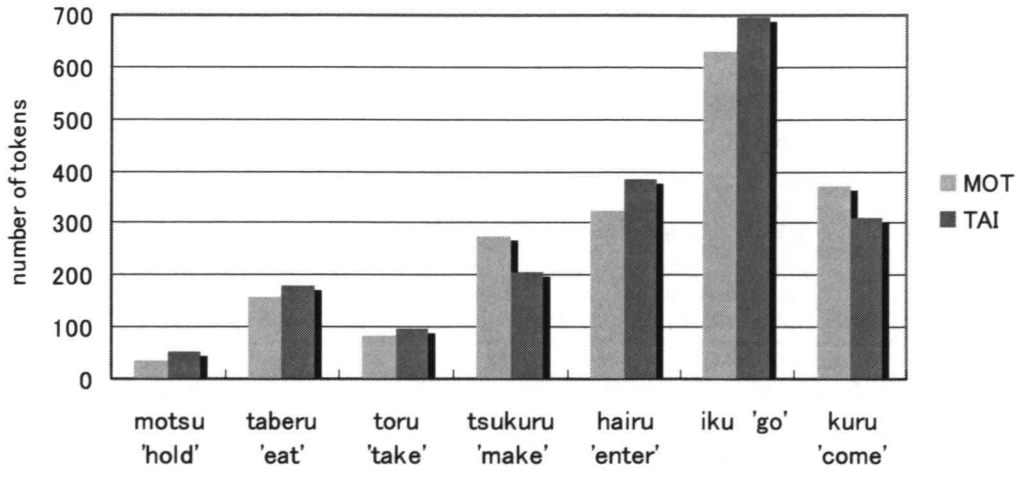

Figure 1 Relative frequency of the seven verbs analyzed (tokens per 100 utterances)

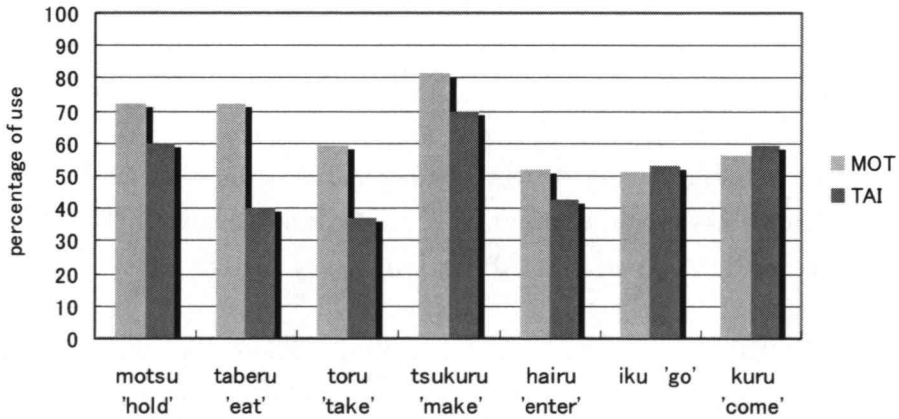

Figure 2 Percentage of argument use with individual verbs for Tai and his mother

c) Proportion of Nominative Arguments

The proportion of the obligatory nominative argument (NOM *ga*) was different for each verb, and ranges between 40% for MOT for *kuru* 'come' (TAI 37%) and 8% for both MOT and TAI in the case of *motsu* 'hold'(Figure 3). The tendencies within each verb were similar for Tai and MOT, except for *taberu* 'eat, where TAI used extremely few nominative arguments (MOT 40%, TAI 10%). On the average TAI used slightly less nominative arguments than his mother: 17% of his sentences included a nominative argument while MOT used nominative arguments in 25% of all cases.

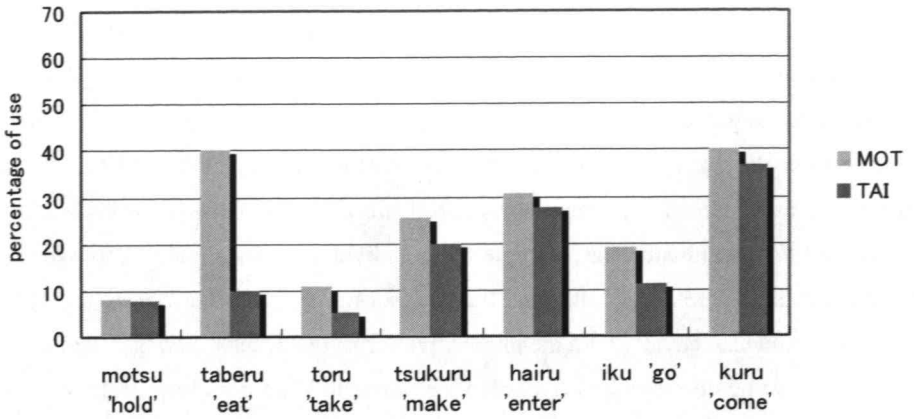

Figure 3 Percentage of nominative argument use for individual verbs for Tai and his mother

d) Percentage of Optional Arguments

Next we compared the use of the optional arguments in the first line accusative for the transitive and directionalis for the intransitive verbs. Depending on the valency structure of the verb, different arguments are possible, but also with verbs of the same valency structure the percentage of use differed to a certain degree. For the transitive verbs *motsu* 'hold', *taberu* 'eat', *toru* 'take', and *tsukuru* 'make', MOT's rate of accusative arguments was rather high and lied between 45% (*toru* 'take') and 63% (*tsukuru* 'make'). TAI's rate of accusative arguments was similarly high for *motsu* 'hold'(52%) und *tsukuru* 'make'(49%), but the rate was considerably lower for *toru* 'take' (29%) and *taberu* 'eat'(23%) (Figure 4).

For the intransitive verbs the rate of directionalis arguments was lower for both mother and child, and the tendency was similar. The highest directionalis argument rate was found for *iku* 'go' (MOT 35% and TAI 38%), while with *kuru* 'come' the rate was rather low (MOT 16%, TAI 14%). For *hairu,* directionalis arguments were realized at 28% (MOT) and 19% (TAI), respectively. (Figure 5).

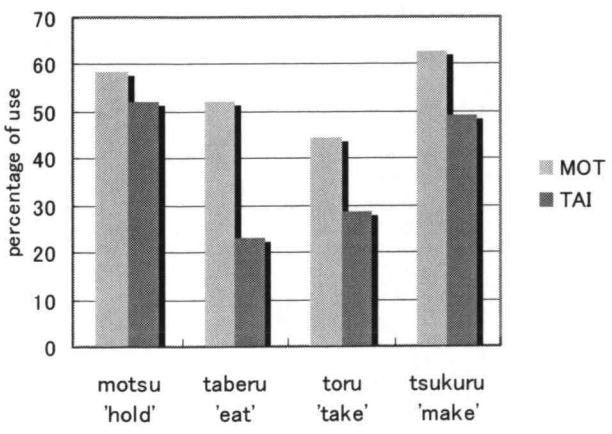

Figure 4 Percentage of accusative arguments for transitive verbs

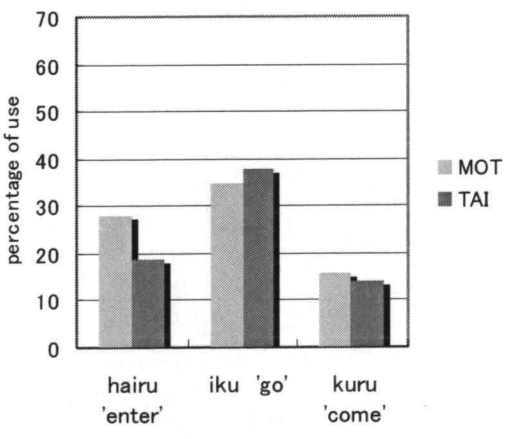

Figure 5 Percentage of directionalis arguments for intransitive verbs

e) Percentage of case particle use

We next examined the percentage of arguments where a particle was used. Overall, there was a great difference

between the different particles. The locative particle *ni* was rather frequent for both mother and child, while the accusative particle *o* was rare. MOT used *ga* with 6.7% of all verbs, and *o* with 0.3%, while TAI used *ga* with 3.8% and *o* with 0.5% of all verbs analyzed (Figure 6). The nominative case particle *ga* was used with 24% (MOT) and 12% (TAI) for all accusative arguments. The use of the accusative particle *o* was marginal with 2% for MOT and 7% for TAI, while the directionalis particle *ni* was frequent with 45% for MOT and 35% for TAI. The category "other" includes the locative *de*, instrumentalis *de*, symmetry *to*, originalis *kara* and the directionalis *made*.

When examining the rate of nominative case particle *ga* for individual verbs (Figure 7), we see that MOT used *ga* with transitive and intransitive verbs alike, although the rate is low, especially for *taberu* 'eat' (11%) and *iku* 'go' (14%). TAI on the other hand uses *ga* only with the intransitive verbs *hairu* 'enter', *iku* 'go', and *kuru* 'come' and the transitive *tsukuru* 'make', while no use of *ga* is recorded for *motsu* 'hold', *taberu* 'eat', and *toru* 'take' (Figure 7).

The rate of accusative case *o* for individual verbs was extremely low for mother and child despite a high rate of argument realization, but interestingly enough, TAI used slightly more *o* with *motsu* "hold" and *toru* 'take' (Figure 8). On the other hand the directionalis *ni* was realized to a higher degree, especially with the verbs *hairu* 'enter' (68% for MOT and 49% for TAI) and *kuru* 'come' (41% for TMO and 43% for TAI). With *iku* 'go', TAI used *ni* less often than did MOT (13% compared to 27%; Figure 9).

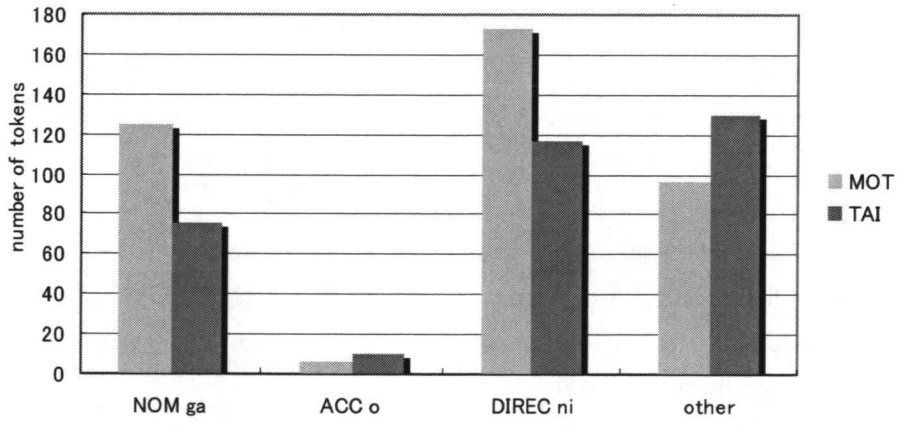

Figure 6 Number of argument constructions with case particles

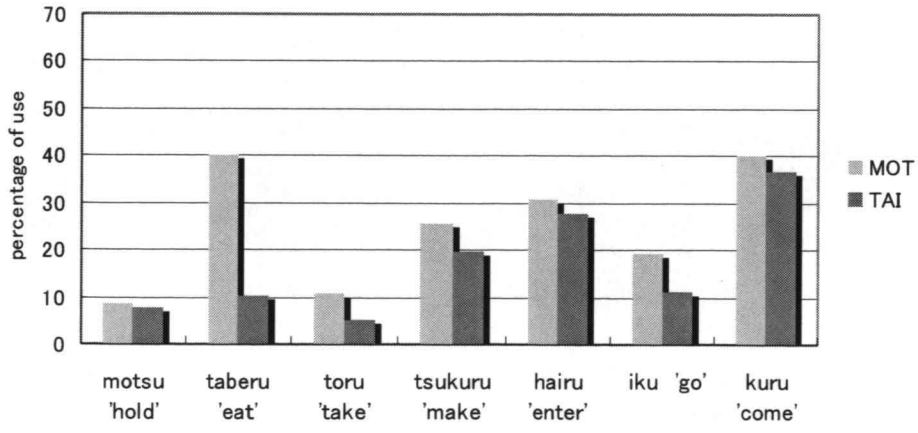

Figure 7 Percentage of nominative arguments with *ga*

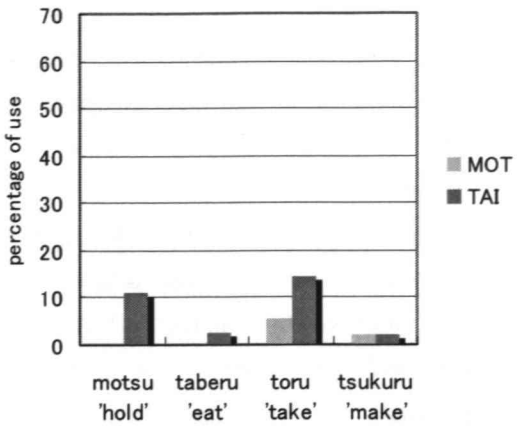

Figure 8 Percentage of accusative arguments with *o*

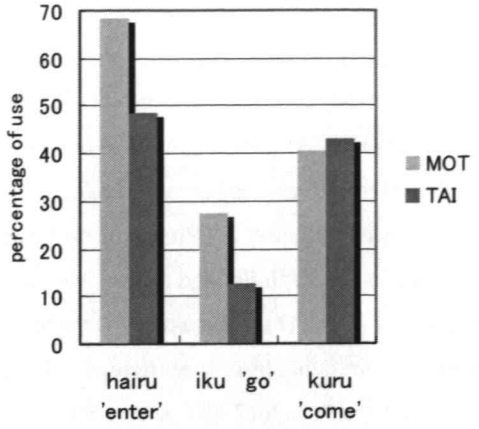

Figure 9 Percentage of directionalis arguments with *ni*

6. Conclusions

Overall we saw a considerable congruence in the argument and case particle use between the child and his mother. The most frequent verbs used by TAI were to a large degree identical to the most frequent verbs used by MOT, and the seven frequent verbs chosen for analysis were used to a similar degree. Also the proportion of arguments used with these verbs was comparable (52% for TAI and 63% for MOT), although TAI tended to use less arguments with the four transitive verbs (*motsu* 'hold', *taberu* 'eat', *toru* 'take', and *tsukuru* 'make') than did MOT. For the three intransitive verbs (*hairu* 'enter', *iku* 'go', and *kuru* 'come') the proportion was very similar between mother and child.

As expected, the proportion of argument types differed between individual verbs. The proportion of the obligatory nominative argument (NOM [*ga*]) was between 40% for MOT (TAI 37%) and 8% (both MOT and TAI). The proportion of accusative arguments was rather high in the case of the transitive verbs, but showed differences between mother and child. While MOT used accusative arguments in 45% to 63% of the structures, TAI's rate of accusative arguments was similarly high for *motsu* 'hold' (52%) und *tsukuru* 'make' (49%) but considerably lower for *toru* 'take' (29%) and *taberu* 'eat' (23%). This can be explained by a different pragmatic focus of mother and child. While his mother focused on the affected object (the thing to be taken or eaten), the child seemed to be more interested in the action itself, which resulted in a lower degree of arguments for these two verbs. In the case of *motsu* 'hold' and *tsukuru* 'make' his interest was directed to the object and (in the case of *tsukuru*) also to the agent. Here his interest was congruent to his mother's focus, as was the case with the three intransitive verbs *hairu* 'enter', *iku* 'go', and *kuru* 'come' which showed a similar argument proportion for TAI and MOT. These results are congruent with our expectations that within the same verb, the proportion of arguments can be different for mother and child out of different pragmatic preferences.

We next examined the percentage of arguments where a case particle was used. We expected a congruent usage for mother and child because the realization of case particles should be less influenced by pragmatic considerations but rather by input frequency. Contrary to these expectations we found differences between Tai and his mother. While the overall frequency of case particles was alike for mother and child with a rare accusative case particle *o* and rather frequent nominative *ga* and locative *ni*, the use with individual verbs differed to a considerable degree. The

nominative *ga* is used by MOT with all verbs to a similarly low degree (between 11% and 36%). TAI on the other hand uses *ga* only with the intransitive verbs *hairu* 'enter', *iku* 'go', and *kuru* 'come' and the transitive *tsukuru* 'make', while no use of *ga* was found for *motsu* 'hold', *taberu* 'eat', and *toru* 'take'. For these three verbs the nominative argument use itself was low, and the few nominative items all appeared without *ga*. Compared with the intransitive *kuru* 'come', TAI provided 40% of all his nominative arguments with *ga* which is 7% more than MOT.

Similarly, we found differences between TAI and MOT in the use of the accusative case particle *o*. Despite high rates of accusative argument use, both used the case particle *o* only very rarely. But while for MOT no use of *o* was recorded for the verbs *motsu* 'hold' and *taberu* 'eat', and only a few times with *toru* 'take' and *tsukuru* 'make' with an overall average of 2%, TAI used *o* with all 4 verbs, especially with *toru* 'take'(14%) and *motsu* 'hold'(11%).

For the use of the directionalis case particle *ni*, both mother and child used the case particle to a rather high degree for *hairu* 'enter' (around 70% for MOT and about half for TAI) and *kuru* 'come' (both around 40%), and less for *iku* 'go'(MOT 27% and TAI 13%). Interestingly, for *iku* 'go' TAI used nominative *ga* as well as directionalis *ni* slightly more often than did MOT, while for the other intransitive verbs his rate was lower for both particles.

How can we explain this different use of the case particles, especially the nominative *ga* and the accusative *o*? We had assumed that the proportion of case particles would directly reflect the input frequency, while the use of an argument would be influenced by pragmatic reasons. But in fact, also the use of a case particle might have a pragmatic side effect. When adding a case particle, the argument is not only unambiguously marked as a nominative or accusative argument, but also highlighted as agent or object. It is possible that the child made use of case particles to a somewhat higher degree because of this pragmatic side affect. However, because of the small absolute number of particle use, especially the accusative *o*, we should be careful not to come to any definite conclusions.

The overall picture shows a rather high rate of congruence between the child and his mother in the argument and particle use, reflecting different tendencies for individual verbs. Only for *taberu* 'eat' and *toru* 'take' did the mother use considerably more arguments than the child. In the case of *taberu* she used four times more nominative arguments and over twice as many accusative arguments, and with *toru* one third more accusative arguments, thus focusing on the agent and object, while the child seemed to be more interested in the action itself and dropped arguments in most cases. This difference was expected, as the different pragmatic focus of mother and child might result in a different proportion of argument use with some of the verbs. The differences we found in the particle use are less clear. We expected different case particle rates for different verbs, but no substantial differences in the usage of mother and child. However, it turned out that TAI used the accusative *o* more frequently with transitive verbs *motsu* 'hold' and *toru* 'take' , and more nominative *ga* with the intransitive *kuru* 'go' than did MOT, although the average rate for each particle was comparable for both. Because of the rather small number of particles in the sample, it is too early to draw a final conclusion, but is possible that these differences indicate a pragmatic use not only of arguments but also of case particles by the child.

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