# Multiple comparisons of IL, L1 and TL corpora: The case of L2 acquisition of verb subcategorization patterns by Japanese learners of English

Yukio Tono
Meikai University, Japan

This study investigates the acquisition of verb subcategorization frame (SF) patterns by Japanese-speaking learners of English by examining the relative influence of factors such as the effect of first language knowledge, the amount of exposure to second language input, and the properties of inherent verb semantics on the use and misuse of verb SF patterns. To do this, three types of corpora were compiled: (a) a corpus of students' writing, (b) a corpus of L1 Japanese, and (c) a corpus of English textbooks (i.e., one of the primary sources of input in the classroom). Ten high frequency verbs were examined for the learners' use of SF patterns. Log-linear analysis revealed that the overall frequency of verb SF patterns was influenced by the amount of exposure to the patterns in the textbooks whereas error frequency was not highly correlated with it. There were strong interaction effects between error frequency and L1-related and L2 inherent factors such as the differences in verb patterns and frequencies between English and Japanese, and verb semantics for each verb type. Multiple comparison of IL, L1, TL (textbook) corpora were found to be quite useful in identifying the complex nature of interlanguage development in the classroom context.

## 1. Introduction

Each individual language has its own way of realizing elements following a verb. Every verb is accompanied by a number of obligatory participants, usually from one to three, which express the core meaning of the event. Participants which are core elements in the meaning of an event are known as *arguments*. Other constituents, which are optional, are known as *adjuncts*. What

core elements follow a verb is accounted for by *subcategorization*. Different subcategories of verbs make different demands on which of their arguments must be expressed (cf. (1a) – (1c)), which can optionally be expressed (cf. (1d)), and how the expressed arguments are encoded grammatically – that is, as subjects, objects or oblique objects (objects of prepositions or oblique cases). For example, as in (1a), the verb "*dine*" is an intransitive verb and takes only one argument (i.e., a subject) while verbs such as *eat* or *put* can take two or three arguments respectively (see 1b and 1c).

(1)   a) Mary dined./ *Mary dined the hamburger.          [1 ARG]
      b) Mary ate./ Mary ate the hamburger.              [2 ARG]
      c) *Mary put./ *Mary put something./ Mary put
         something somewhere.                            [3 ARG]
      d) Tom buttered the toast *with a fish-knife*.       [optional]

In this paper, I will present a study which investigates the acquisition of verb subcategorization frame (SF) patterns by Japanese-speaking learners of English. For this study, I compiled three different types of corpora: Interlanguage (IL), L1 and Target Language (TL). For IL corpora, students' free compositions were used whilst newspaper texts and EFL textbooks were assembled for L1 and TL corpora respectively. I will discuss the rationale of using textbooks as TL corpora in more detail below. By conducting multiple comparisons of the three corpora, I examined how different factors such as the effect of L1 knowledge, the amount of exposure to L2 input, and the properties of inherent verb meanings in L2 affect the acquisition of verb SF patterns.

The acquisition of SF patterns is often associated with the broader issue of the acquisition of argument structure (Pinker 1984, 1987, 1989). The development of argument structure can be influenced by several factors. Four main factors (verb semantics, learning stage, L1 knowledge, and L2 input) were selected and the relationship of these factors to the use/misuse of argument structure was investigated. An L1 corpus was used to define the influence of verb SF patterns in L1 while ELT textbook corpora were used for determining the degree of exposure to certain SF patterns in the classroom. Based on the data from these corpora, I compared the SF patterns of a group of high-frequency verbs in the Japanese EFL Learner (JEFLL) Corpus.

## 2. Factors affecting the acquisition of SF patterns

### 2.1 Views from L1 acquisition research

There are competing theories seeking to explain the acquisition of argument structure in L1 acquisition. The major issue is how to explain the children's initial acquisition of argument structure. Do they learn the argument structure patterns from the meaning of verbs they initially acquire or do they acquire the structure first, then move on to the acquisition of verb meanings? The two bootstrapping hypotheses, semantic and syntactic, claim that the acquisition of argument structure is bootstrapped by first acquiring either semantic or syntactic properties of the verbs. Pinker (1987) is keen to identify what happens at the very first stage of syntax acquisition while Gleitman (1990) states the hypothesis in such a way that it applies not only to the initial stage but to the entire process of acquisition. As Grimshaw (1994) argues, however, these two hypotheses could complement each other, once the initial state issue is solved.

Despite the difference in the view of how the acquisition of argument structure starts, Pinker and Gleitman both agree that knowledge of the relationship between a verb's semantics and its morpho-syntax is guided in part by Universal Grammar (UG) (cf. Chomsky 1986) because adult grammars go beyond the input available. According to Goldberg (1999), on the other hand, it is a construction itself which carries the meaning. Although verbs and associated argument structures are initially learned on an item-by-item basis, increased vocabulary leads to categorization and generalization. "Light" verbs, due to the fact that they are introduced at a very early stage and are highly frequent, act as a centre of gravity, forming the prototype of the semantic category associated with the formal pattern.

The perspective which Goldberg and other construction grammarians have taken on children's grammar learning is fundamentally that of "general" nativism. They reject the claim of "special" nativism in its particular guise of UG, but they still assume other, innate, aspects of human cognitive functioning accounting for language acquisition. As a matter of fact, this position is increasingly widely supported nowadays within more general cognitive approaches, including so-called emergentism (Elman et al. 1996; MacWhinney 1999), cognitive linguistics (Langacker 1987, 1991; Ungerer and Schmid 1996) and constructivist child language research (Slobin 1997; Tomasello 1992).

One of the purposes of this study is to determine the relative effect of L1 knowledge, classroom input, developmental factors and inherent verb semantics on the use/misuse and overuse/underuse of SF patterns by Japanese learners of English. It should be noted that the study does not need to call on a specific acquisition theory at this stage. Rather, this corpus-based study should shed light on the nature of IL development by weighting the factors which are possibly relevant to the acquisition of argument structure. This will help to evaluate the validity and plausibility of the claims made in L1 acquisition research in the light of SLA theory construction. For instance, if the study shows the strong effect of frequencies of verbs used in the ELT textbooks on the use of particular SF patterns, then the results may indicate that L2 acquisition can be better explained by the theory that attaches more importance to the frequency of the items to be acquired in the input. From this viewpoint, Goldberg's theory is more plausible. On the other hand, if the effect of verb semantics is highly significant, one may be inclined to agree with the theory that emphasises the semantic properties of verbs as the driving force for the acquisition of argument structure. Hence one would be more likely to adopt the theoretical framework of semantic bootstrapping theory proposed by Pinker (see 1 above).

This study has the potential, therefore, to tease out possible factors affecting L2 acquisition in the light of L1 acquisition theories, making observations on L1, TL, and IL corpus data while controlling all those selected factors, and finally giving each factor a weighting according to the results of the corpus analysis. This weighting of the factors relevant to L2 acquisition will then contribute to decision-making about which L1 acquisition theory is more plausible.

## 2.2 Views from L2 acquisition research

Whilst a vast literature exists on the L1 acquisition of semantics-syntax correspondences, second language acquisition of verb semantics and morpho-syntax only really attracted detailed attention in the 1990s. The major issues in L2 acquisition of argument structure are: (1) whether or not L1 effects are strong in this area, (2) whether there is any evidence of universal patterns of development, and (3) the role of input in the acquisition of argument structure.

From the previous SLA studies, L1 effects appear strong in the acquisition of argument structure. Especially SF frames are a case in point. Recently, there

has been much investigation of the proposal that the SF requirements of a lexical item might be predictable from its meaning (Levin 1993: 12). The issue here is whether such lexical knowledge in L1 or in UG will affect L2 acquisition. This is usually investigated through the study of the acquisition of diathesis alternations[1] – alternations in the expression of arguments, sometimes accompanied by changes of meaning – verbs may participate in.

In the case of dative alternations (White 1987, 1991; Bley-Vroman and Yoshinaga 1992; Sawyer 1996; Inagaki 1997; Montrul 1998), most evidence seems to indicate that the initial hypothesis regarding syntactic frames is based on the L1. Studies on the locative alternations (Juffs 1996; Thepsura 1998 cited in Juffs 2000) indicate that there is a difference in the way a hypothesis is formed by learners at different proficiency levels. While beginning learners start off with a wider grammar for non-alternating locative verbs, very advanced learners end up with a narrower grammar (Juffs 1996). There are several studies (Zobl 1989; Hirakawa 1995; Oshita 1997) that indicate an L1 transfer effect on transitivity alternations and the unergative/unaccusative distinction. To recapitulate, L1 effects appear strong in this area of grammar. Based on their L1, learners transfer and overgeneralize in the dative and the locative alternations. They also show a preference for morphology for inchoatives. Consequently, learners are helped if their L1 has certain features which are also in the L2. Advanced learners, however, seem able to recover from overgeneralization errors in some instances by acquiring narrow conflation classes which are not in their L1. Thus there seems to be an interaction effect between L1 influence and proficiency levels.

In spite of studies showing L1 effects, there is some evidence of universal patterns of development. Learners from a variety of backgrounds seem to use passive morphology for NP movement in English L2 with pure unaccusatives (Yip 1994; Oshita 1997). English-speaking learners of Spanish seem to use *se* selectively for the same purpose even when it is not required with unaccusative verbs (Toth 1997). Montrul (1998) found evidence which indicates that L2 learners have an initial hypothesis that all verbs can have a default transitive template, allowing an SVO structure in English even with pure unaccusatives and unergatives. Hence, learners seem to overgeneralize causativity in root morphemes much as children acquiring their first language do.

There are not many studies on the role of input in the acquisition of verb meaning and the way such knowledge relates to syntax. Inagaki (1997) argues that the fact that the double-object datives containing "*tell*"-class verbs were

more frequent in the input than those containing "*throw*"-class verbs, explains why the Japanese learners distinguished the *tell* verbs more clearly than the *throw* verbs. The fact that the English native speakers made a stronger distinction between the *tell/whisper* verbs than between the *throw/push* verbs is also consistent with the assumption that the double-object datives containing the *tell* verbs were more frequent in the input than those containing the *throw* verbs (ibid:660). Unfortunately, measuring the frequency in L2 input is difficult since so few analyses of input corpora for L2 learners exist (Juffs 2000:202).

## 3.   JEFLL Corpus and the multiple comparison approach

The JEFLL Corpus project aims to compile a corpus of Japanese EFL text produced by learners from Year 7 to university levels. The strength of the JEFLL Corpus is that it contains L1 and TL corpora as an integral part of its design. As was shown in the last section, very few studies have made use of both attested L2 learner data and L1/TL data to identify features of interlanguage development, let alone a corpus-based analysis of these data. Most learner corpus studies to date have made use of NS corpora because the studies are typically focused on learning English, and many native English corpora are readily available as a standard reference, whereas very few studies (except for JEFLL and PELCRA, see Leńko-Szymańska, this volume) collect parallel L1 corpora for comparison.

Figure 1 shows the overall structure of the JEFLL Corpus. The total size of the L2 corpus is approximately 500,000 running words of written texts and 50,000 words of orthographically transcribed spoken data. The L1 corpus consists of a corpus of Japanese newspaper texts (approximately 11 million words) plus a corpus of student compositions written in Japanese. The L1 Japanese-language essays were written on the same topics as the ones used for the L2 English composition classes.

The third part of the JEFLL Corpus comprises the TL corpus. It is a corpus of EFL textbooks covering both junior and senior high school textbooks. The junior high school textbooks are the ones used officially at every junior high school in Japan. There are seven competing publishers producing such textbooks. Irrespective of which publisher one chooses, each publishes three books corresponding to the three recognized proficiency grades for years 7–9.

Table 1. The JEFLL Corpus project: Overall structure

Part 1: L2 learner corpora
- Written corpus (composition): ~500,000 words
- Spoken corpus (picture description): ~50,000 words

Part 2: L1 corpora
- Japanese written corpus (composition): ~50,000 word, same tasks as in relevant L2 corpus
- Japanese newspaper corpus: ~11,000,000 words

Part 3: TL corpus
- EFL textbook corpus: ~650,000 running words (Y7-9: 150,000; Y10-12; 500,000)

Senior high school textbooks are more diversified and more than 50 titles have been published. This corpus contains mainly the textbooks for English I and II (general English).

I would argue that textbook English is a useful target corpus to use in the study of learner language. As this claim runs counter to that of other researchers (e.g., Ljung 1990; Mindt 1997), it is important to examine the basis for this claim in some detail. Firstly, the target language which learners are measured by should reflect the learning environment of learners. It is not always appropriate to use a general corpus such as the BNC or the Bank of English to make comparisons with non-native-speaker corpora. The differences you will find between L2 corpora and such general corpora will be those between learner English and the English produced by professional native-speaker writers. Such a comparison may be meaningful in the case of highly advanced learners of English or professional non-native translators. The output of such highly advanced learners, however, is something which the vast majority of L2 learners in Japan never aspire to. We have to consider very seriously what the target norm should be for the learners we have in mind. In the present case, it is certainly not the language of the BNC that the Japanese learners of English are aiming at, but, rather, a modified English which represents what they are more exposed to in EFL settings in Japan. I am fully aware of the fact that the type of language used in ELT textbooks may be unnatural in comparison to actual native speaker usage (see, for instance, Ljung 1990, 1991 and Römer, this volume). Pedagogically, however, beginning- or intermediate-level texts are designed to contain a level and form of English which can facilitate learning. In spite of all their peculiarities in comparison with L1 corpora, these textbooks represent the primary source of input for L2 learners in Japan, and as such their use in explaining and assessing L2 attainment is surely crucial.

The ELT textbook is the primary source of English language input for learners in Japan. Inside the classroom, some teachers will use classroom English, and others will not use English at all as a medium of instruction. Even if they do use English in the classroom, they usually limit their expressions to the structures and vocabulary that have previously appeared in the textbook. Outside the classroom, those who go to "cram" schools – private schools where students study after school to prepare for high school or university entrance examinations – will receive extra input, but this input is comprised of questions borrowed from past entrance exams, or questions based on the contents of the textbooks (Rohlen 1983). Hence, it is fair to say that the English used in ELT textbooks is the target for most learners of English in Japan. If we exclude textbooks from our investigation, explaining the differences between TL and IL usage may be impossible. However, where textbooks are included in an exploration of L2 learning, they can explain differences between NS and NNS usage (McEnery and Kifle 1998).

While the above argument presents the basis for the inclusion of textbooks in my model for the study of learner language, more evidence is required to substantiate this claim. This will be provided below, as part of the description of some of my research results, where the textbook corpus will be called upon to provide an explanation for differences between IL and TL. For the moment I will take the argument presented so far as sufficient evidence to warrant the inclusion of textbook material in my learner corpus exploitation model. My proposal, therefore, is that standard reference (e.g., the BNC), textbook and learner corpora all have roles to play in a fuller and proper exploration of learner language, a method which we may refer to as the "multimethod comparison" approach. Figure 1 illustrates this point diagrammatically.

"IL1 ↔ ILx" in Figure 1 refers to the different subcorpus divisions according to academic year that L2 learner texts may be divided into. These *IL-IL comparisons* can be of several different types, depending on the learner variables. For instance, if the independent variable (i.e., the variable that you manipulate) is age or the academic year of the learners, with all other variables constant, one can make a comparison of different IL corpora from different age groups. In ICLE (International Corpus of Learner English, Granger et al. 2002), on the other hand, the age (or proficiency level) factor is held constant, and research using ICLE centres around the IL characteristics of different L1 groups.

A comparison between L2 corpora and TL corpora can also be made (see (B) in figure 1). One can use either a general standard corpus such as the Brit-
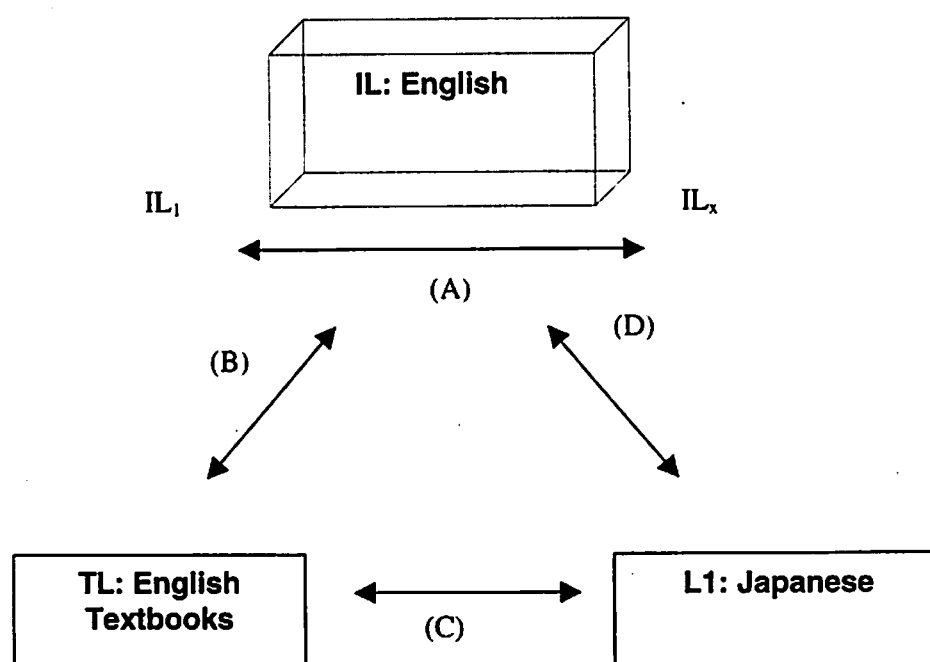
Figure 1.  Multiple comparison of L1, TL and IL corpora

ish National Corpus to look at differences in, for example, lexicogrammar between native speakers and L2 learners, or use a more comparable corpus of native-speaker texts, e.g., LOCNESS (Louvain Corpus of Native English Essays)[2] in ICLE, to compare like with like. We can refer to this type of comparison as *IL-TL comparison*.

TL corpora may be are compared with L1 corpora (*TL-L1 comparison*, cf. (C) in figure 1) in order to describe the target adult grammar system and identify potential causes of L1 transfer. This analysis should be combined with L2 corpus analysis. TL-L1 comparison could provide significant information on the influence of the source language on the acquisition of the target language.

A fourth type of comparison is that between IL corpora and L1 mother tongue corpora (*L1-IL comparison*, cf. (D) in figure 1). L1 corpora can provide information on features of the L2 learners' native language, which can help us understand potential sources of L1-related errors or overuse/underuse phenomena. Despite the sophistication of recent error taxonomies, it is rather difficult to distinguish interlingual errors from intralingual ones, unless some empirical data are available on the pattern of a particular linguistic feature in both languages. L1-IL comparisons provide fundamental data in this area.

Table 2 summarises each comparison type.

Table 2. Multiple comparison approach

| Comparison | Description |
| --- | --- |
| IL-IL comparison | Comparisons between different stages of ILs or ILs by learners with different L1 backgrounds. |
| IL-TL comparison | Comparisons between learner corpora and target language corpora (i.e. ELT textbook corpora in the present study, or general native corpora). |
| TL-L1 comparison | Comparisons between target language corpora and L1 mother tongue corpora (to identify potential causes of L1 transfer). |
| L1-IL comparison | Comparisons between L1 corpora and learner corpora (to identify L1-related errors or overuse/underuse phenomena). |
| IL-L1-TL comparison | Combination of the above comparisons (to identify the complex relationship between IL, L1 and TL corpora on L2 learners' error patterns or overuse/underuse phenomena). |

## 4. The relationship between factors and corpora used

Table 3 shows the factors to be examined in this study and how corpus data can supply the relevant information. It is only through multiple comparisons of L1, TL, and IL corpora that such issues can be fully addressed. Note that the primary purpose of this study is not to identify the role of specific UG constraints in L2 acquisition. Rather, the study aims to capture the cause-effect relationships among those variables and to identify their relative effects on the acquisition of argument structure in L2 English.

Table 3. The relationship between the factors in this study and types of information from different corpora

| Factors | Corpus data |
| --- | --- |
| The L1 effects | Frequency of similar/different argument structure properties in L1 corpus |
| The L2 input | Frequency of subcategorization patterns in ELT textbook corpus |
| Developmental stages | Frequency of use/misuse of subcategorization patterns from the developmental IL corpus |
| The L2 internal effects | Frequency of different verb classes and alternations from the IL corpus |

## 5.   Research design

### 5.1  Research questions

This study has the following research questions:

1.  Which of the following variables affect L2 acquisition of argument structure (most)?
    *   The L1 effects
    *   The L2 input effects
    *   The L2 internal effects
    *   The developmental effects
2.  Are there any interaction effects between the variables? If so, what are they?

The clarification of the relationship between the above questions will contribute to current SLA research especially in terms of the possible role of L1 knowledge, L2 classroom input, and verb semantics-syntax correspondences in the acquisition of argument structure.

### 5.2  Variables and operational definitions

Each variable is operationally defined as follows:

1.  L1 effects:
    L1 effects were examined with respect to the following two aspects: the degree of similarities in SF patterns between English and Japanese in terms of (a) the degree of SF matching and (b) the frequencies of similar SF patterns in the L1 Japanese corpus and the COMLEX Lexicon (TL).
2.  L2 input effects:
    L2 input effects were defined in terms of the frequencies of the given SF patterns in the L2 textbook corpus.
3.  L2 internal effects:
    These characteristics pertain to the English verb system. For differences in verb classes and alternation types I follow Levin's (1993) classification.
4.  Developmental effects:
    Developmental effects were simply measured in relation to the three groups of subjects categorized by their school years (Year 7-8; 9-10; 11-12).

## 5.3 Extraction of SF patterns

For this study, I parsed the learner and textbook corpora using the Apple Pie Parser (APP), a statistical parser developed by Satoshi Sekine at New York University (see Sekine 1998 for details). The accuracy rate of the APP is approximately 70%, hence it was not very efficient to extract SF patterns automatically using the APP alone. Consequently, after running the parser over the corpus, I exported concordance lines of verbs with the automatically assigned syntactic information into a spreadsheet program and then categorized them into SFs using pattern matching. This proved to be an efficient means of studying verb SFs.

The Comlex Lexicon (Macleod et al. 1996; Grishman et al. 1994) was also referred to for frequency information relating to some subcategorization frames in the TL corpus. The Comlex Lexicon itself does not provide complete frequency data for all SF patterns. However, it has frequency information for the subcategorization frames of the first 100 verbs appearing in the Brown Corpus. I calculated the percentages of each SF pattern in the Comlex database and used the information to supplement the data from the textbook corpus.

For the L1 corpus, a Japanese morphological analyser, *ChaSen* (Matsumoto et al. 2000), was used for tokenization and morphological analysis and the frequencies of SF patterns were detected by using pattern matching. SF extraction was done after extracting all the instances of a particular verb under study, and thus manual postediting was also possible.

## 5.4 Categorization of verb classes

The verb classification in Levin (1993) was used to categorize verbs into groups with similar meanings. Levin classifies verb classes into two major categories: (a) those which undergo diathesis alternations and (b) those which form semantically coherent verb classes. While Levin's classification is very important for the study of lexical knowledge in the human mind, it should also be noted that her study is not concerned with the actual usage of those verb classes. Out of the 49 verb classes Levin created, only 22 classes were found in the top 40 most frequent verbs in the BNC. An important fact to note, therefore, is that a small number of categories which meet essential communication needs (e.g., "communication', "motion', and "change of possession') predominate in actual verb usage. The input thus consists of only a handful of highly

frequent verb classes, with the rest of the classes being rather infrequent.

The information on Japanese SFs was obtained from the IPAL Electronic Dictionary Project.[3] After making a matching database of corresponding verbs in English and Japanese, the frequency information of English SFs was extracted from the Comlex Lexicon. SFs were also extracted from the ELT textbook corpus for TL (English) and from the Japanese corpus I made for L1 Japanese.

The next step in the study involved a statistical analysis of these data, taking the various influences into account. Log-linear analysis was the method employed, and the next section gives a summary of the procedure.

## 5.5 Log-linear analysis

The objective of log-linear analysis is to find the model that gives the most parsimonious description of the data. For each of the different models, the expected cell frequencies are compared to the observed frequencies. A Chi-square test can then be used to determine whether the difference between expected and observed cell frequencies is acceptable with an assumption of independence of the various factors. The least economical model, the one that contains the maximal number of effects, is the *saturated* model; it will by definition yield a "perfect" fit between the expected and observed frequencies. The associated $\chi^2$ is zero. In this study, the procedure called *backward deletion* was employed. This begins with the saturated model and then effects are successively left out of the model and it is checked whether the value of $\chi^2$ of the more parsimonious model passes the critical level. When this happens, the effect that was left out last is deemed essential to the model and should be included.

Several statistical packages contain procedures for carrying out a log-linear analysis on contingency tables, e.g., SPSS, STATISTICA, SAS. In this study, STATISTICA was the main program used for model testing.

## 5.6 Subcategorization frame database

For each high-frequency verb, the following information was gathered and put into the database format:

- Parsed example sentences containing the target verb
- School year categories (year 7–8; 9–10; 11–12)

- Verb name
- Verb class
- Verb meaning
- Alternation type
- SF for each example
- Frequency of SF in COMLEX Lexicon
- TL frequency of the given SF (i.e., textbook corpora)
- Learner errors
- Parsing errors
- Japanese verb equivalents
- L1 frequency of the equivalent SF (i.e., Japanese corpus)

These data were collected for each of the high-frequency verbs and exported to the statistical software used for further analysis. In order to process the data by log-linear analysis, the frequencies of TL and L1 were converted into categorical data ([HIGH]/ [MID]/ [LOW]). In order to study the acquisition of argument structure, ten verbs were selected for the analysis (*bring, buy, eat, get, go, like, make, take, think*, and *want*). While it would have been desirable to cover as many verbs as possible from different verb classes for the study, it should be noted that frequencies of SF patterns become extremely small if low frequency verbs are included. Only the ten most frequent verbs in the data were therefore selected for investigation, since these allowed a sufficient number of observations to be made for each verb. Even though they are frequent, *be* and *have* were excluded from the analysis because their status as lexical verbs is very different from that of other verbs. Due to limitations of space, I cannot go into the details of the SF patterns, but interested readers may consult Tono (2002).

## 6.   Results

### 6.1. The results of log-linear analysis for individual verbs

Using log-linear analysis, I tested various models using combinations of the six factors in Table 4.

The results of the log-linear analysis of each individual verb revealed quite an interesting picture of the relationship between learner errors and the chosen

Table 4.    Factors investigated in the study

- L2 learners developmental factor (Factor 1):
   3 levels: Year 7–8/ Year 9–10/ Year 11–12
- Subcategorization matching between L1 and L2 (Factor 2):
   2 levels: Matched/ Unmatched
- Subcategorization frequencies of each SF pattern in COMLEX (Factor 3):
   3 levels: High/ Mid/ Low
- Subcategorization frequencies of each SF pattern in L1 Japanese Corpus (Factor 4):
   3 levels: High/ Mid/ Low
- Subcategorization frequencies of each SF pattern in Textbook Corpus (Factor 5):
   3 levels: High/ Mid/ Low
- L2 learner errors (Factor 6):
   2 levels: Error/ Non-error

factors. Here let me summarise results by putting all the best fitting models together in a table (see table 5) and examining which factor exerts the most influence on learner performance across the ten verbs.

In order to analyse the interactions, graphical interpretations of higher dimensional log-linear models are sometimes used (e.g., McEnery 1995; Kennedy 1992). However, as I am dealing with six dimensional models here, attempting to interpret them using graphical models would be extremely complicated. Also, my primary aim is not to interpret individual cases but to capture the overall picture of how factors are related across different verbs. Consequently I will not interpret the models visually, but simply provide an outline of the main results.

### 6.1.1 Distinctive effects of the school year

Table 5 shows that the school year factor (YEAR) has a very strong effect across all of the verbs. For five out of the ten verbs (*buy, get, go, make,* and *think*), the main effect of YEAR was observed. The YEAR effect also has two-way interactions with the factor of text frequency (TEXTFRQ) for four verbs (*bring, like, take, want*) and with the learner error/non-error factor (LERR) for the verb *get.* This shows that the number of years of schooling influences the way L2 learners use the verbs. It involves both the use/misuse and the overuse/underuse of verbs.

Table 5. Summary of log-linear analysis

| Verbs | Factor 1 YEAR | Factor 2 SUBMATCH | Factor 3 COMLEX | Factor 4 L1FRQ | Factor 5 TEXTFRQ | Factor 6 LERR |
|---|---|---|---|---|---|---|
| bring | <u>51</u> | 532, 432 | 643, 543 532, 432 | 643, 543 432 | 543, 532 <u>51</u> | 643 |
| buy | <u>1</u> | 642, 632 542, 532 | 532, 543 632 | 642, 543 542, | 543, 542 532 | 642, 632 |
| eat |  | 642, 632 432, 521 | 632, 531 432 | 642, 432 | 531, 521 | 642, 632 |
| get | <u>1, 61</u> | 432, 532 | 643, 543 432 | 643, 543 432 | 543, 532 | <u>61</u>, 643 |
| go | <u>1</u> | 632, 542 432, 532 | 632, 543 432, 532 | 543, 542 432 | 543, 542 532 | 632 |
| like | <u>51</u> | 652, 542 532 | 643, 543 532 | 643, 543 542 | <u>51</u>, 652 543, 542 532 | 652, 643 |
| make | <u>1</u> | 642, 632 542, 532 | 632, 543 532 | 642, 543 542 | 543, 542 532 | 642, 632 |
| take | <u>51</u> | 632, 632 532 | 632, 543 532 | 642, 543 | <u>51</u>, 543, 532 | 642, 632 |
| think | <u>1</u> | 642, 632 542, 532 | 632, 543 532 | 642, 543 542 | 543, 542 532 | 642, 632 |
| want | <u>31</u> | 642, 632 542 | 632, 543 31 | 642, 543 542 | 543, 542 | 642, 632 |

Note: The numbers correspond to the factors described in Table 4. A single underlined number (e.g. 1) is used for the main effect, two (e.g. 51) for the two-way interaction effect, and three (e.g. 642, 532) for the three-way effects.

### 6.1.2 Strong effects of the SF frequencies in the textbook corpus

We can also see from the summary table that there are strong two-way effects between YEAR and TEXTFRQ. Note that there is only one case (652 for the verb like) of interaction of the textbook frequency factor (Factor 5) with the learner error factor (Factor 6). This implies that SF frequencies in the textbooks mainly affect the overuse/underuse of the verbs, not the use/misuse.

### 6.1.3 SF similarities and frequencies in L1 and TL

Factors such as the degree of similarity in SF patterns between English and Japanese (SUBMATCH: Factor 2), the frequency in the COMLEX lexicon (Factor 3), and the frequency of SF patterns in L1 Japanese (L1FRQ: Factor

4) appear many times with the learner error factor (LERR: Factor 6). These factors are different from the school year and textbook frequency factors, as they represent more inherent linguistic features of the verbs and L1 effects. Each of the effects, however, is not very strong because none of them survived backward deletion for the one-way or two-way effects. It seems that only the interactions of these factors affect learners' use/misuse of the verbs.

## 6.2 The effects of verb classes and alternation types

In order to analyse the relationship between verb classes/alternation types and the results of the above log-linear analysis, I used correspondence analysis (for more details, see Tono 2002). Instead of looking at each verb, I labelled each verb with its verb semantic classes and alternation types. I then gave scores to each factor according to the significance of its effects as shown in table 5; for instance, if a certain factor has a one-way interaction, which is the strongest, I gave it 10 points; if it has a two-way interaction, I gave 5 points to each of the factors involved. Only 1 point was given for each of the factors involved in three-way effects. In this way, I quantified each of the effects in the best model for each verb in table 5 and used correspondence analysis to see the relationship between the six factors and verb classes and alternation types.

Figure 2 shows the results of the re-classification of the effects found by log-linear analysis for each verb according to verb alternation types. Correspondence analysis plots the variables based on the total Chi-square values (i.e., inertia): the more the variables cluster together, the stronger the relationship. Dimension 1 explains 71% of inertia, so we should mainly consider Dimension 1 as a primary source of interpretation. The figure shows clearly that there are three major groups of effects: the factor of SF patterns in the textbook corpus (TEXTFRQ) in the left corner, three effects (SF frequencies in L1 corpus, the degree of matching between English and Japanese SFs, and the SF frequencies in COMLEX) in the centre, and the learner error effect and the school year effect toward the right side. As was discussed above, the school year represents the developmental aspect of verb learning while the three factors in the middle represent linguistic features in each verb, and the textbook frequency represents L2 input effects.

There is a tendency for verbs involving benefactive alternations (*buy, get, make,* and *take*), sum of money alternations (*buy, get,* and *make*), and *there* insertions (*go*) to cluster around the school year factor and the error factor.
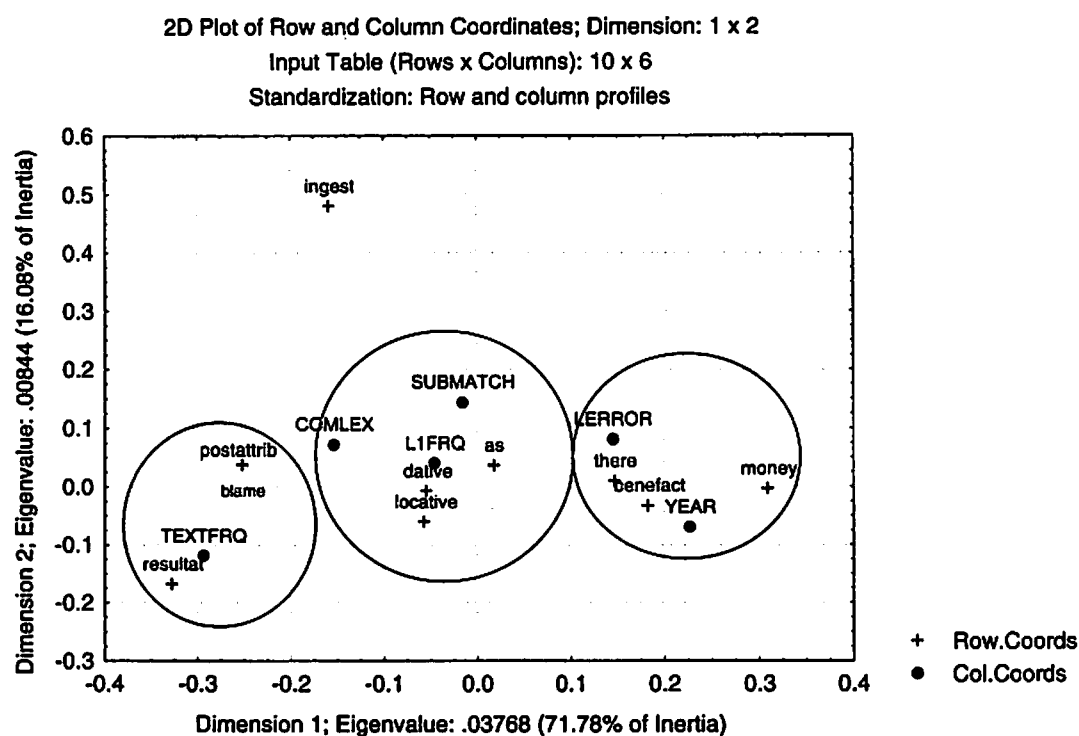
Figure 2.  Correspondence analysis (alternations x effects)

Thus these verb alternation classes seem to be sensitive to the developmental factor of acquisition. Dative (*bring, make, take, think,* and *want*), locative (*take, go*) and *as* alternations (*make, take* and *think*) cluster around inherent linguistic factors such as the degree of SF matching and SF frequencies in L1 and TL. The verbs involving resultative alternations (*bring* and *take*) cluster around the textbook SF frequencies factor. Post-attributive and *blame* alternations are both features of the verbs *like* and *want*. These two alternation types also cluster together close to the textbook frequency effect. These are the verbs showing a strong relationship with L2 input effects. There is only one alternation type that did not cluster with any other groups: ingestion (*eat*). The verb *eat* was very frequent in the learner data and was thus included in the analysis. However, it turned out that there were neither very many errors nor many varieties of alternations for this verb. The results for *eat* thus look very different from those for the other nine verbs.

## 7.   Implications and conclusions

In this paper, I have discussed some initial findings concerning the developmental effect of schooling, L1 effects, L2 input effects and L2 internal effects

(i.e., verb classes and alternations) on the overall use of a small number of very frequent verbs. I hope to have given an idea of the potential of a multiple comparison approach using IL, L1 and TL corpora for the study of classroom SLA.

This study shows that it is valuable to compile corpora which represent different types of texts L2 learners are exposed to or produce, and to compare them in different ways to identify the relative strength of the factors involved in classroom SLA. Especially the method of comparing interlanguage corpora assembled based on the developmental stages, together with the subjects' L1 corpus and TL textbook corpus seems to be quite promising in identifying the complex nature of interlanguage development in L2 classroom settings.

As regards L2 acquisition of verb SF patterns, the results show that the learners' correct use of verb SF patterns seemed to have little to do with the time spent on learning. Learners used verbs more often which they encountered more often in the textbooks, which is rather unsurprising. What is surprising is the fact that there was no significant relationship between learners' correct use of those verbs and the frequency of those verbs in the textbooks. In other words, they continue to make errors related to the SF patterns of certain verbs even though their frequencies are relatively high in the textbooks. The study also reveals that the misuse of those verb patterns is mainly caused by the factors which are inherent in L2 verb meanings and their similarities and differences with L1 counterparts.

There is a tendency for certain alternation types to be more closely related to certain effects. For instance, benefactive alternations are linked to the developmental factor more strongly while dative and locative alternations are related to L1 effects more positively. Given that most SLA studies so far have only provided very fragmented pictures of different alternation types, it is beyond the scope of this study to determine the reason for such associations. To date, no SLA research has been conducted to identify the relative difficulties of different verb classes and alternations. This study does so. However, the theoretical implications arising from this study are a moot point until further research in this area is undertaken.

Future studies of SLA will also require a large and varied body of L2 learner corpora. As we work together with researchers in natural language processing (NLP), there is the possibility that we will be able to develop a computational model of L2 acquisition. Machine learning techniques will facilitate the testing of prototypical acquisition models and the collection of probabilistic informa-

tion on IL using corpora. Computational analyses of IL data will shed light on the process of IL development in a way we never thought possible. For this to happen, well-balanced representative corpora of L2 learner output, along with appropriate TL and L1 corpora are indispensable.

## Notes

1. Here by *alternation* I mean "argument-structure" alternation such as in the dative alternation (e.g. John gave a book to Mary/John gave Mary a book), the causative/inchoative alternation (He opened the door/ The door opened) among others.

2. http://www.fltr.ucl.ac.be/fltr/germ/etan/cecl/Cecl-Projects/Icle/locness1.htm (visited 10. 5. 2004)

3. IPAL is a machine-readable Japanese dictionary. For more details see http://www.ipa.go.jp/ STC/NIHONGO/ IPAL/ipal.html (visited 1.3.2004).

## References

Bley-Vroman, R. and Yoshinaga, N. 1992. "Broad and narrow constraints on the English dative alternation: Some fundamental differences between native speakers and foreign language learners". *University of Hawai'i Working Papers in ESL*, 11: 157–199. University of Hawaii at Manoa.

Chomsky, N. 1986. *Knowledge of Language: Its Nature, Origin and Use*. New York: Praeger.

Elman, J.L., E. Bates, M. Johnson, A. Karmiloff-Smith, D. Parisi and K. Plunkett 1996. *Rethinking Innateness: A Connectionist Perspectives on Development*. Cambridge, MA: A Bradford Book.

Gleitman, L. 1990. The structural sources of verb meaning. *Language Acquisition* 1: 3–55.

Goldberg, A. 1999. "The emergence of the semantics of argument structure constructions". In B. MacWhinney (ed.), 197–212.

Granger, S., Dagneaux, E., and Meunier, F. (eds). 2002. *The International Corpus of Learner English. Handbook and CD-ROM. Version 1.1*. Louvain-la-Neuve: Presses Universitaires de Louvain.

Grimshaw, J. 1994. "Lexical reconciliation". In *The Acquisition of the Lexicon*, L. Gleitman and B. Landau (eds), 411–430. Cambridge, MA: MIT Press.

Grishman, R.-C. Macleod and A. Meyers 1994. "Comlex syntax: Building a computational lexicon". *Proceedings of 15th International Conference in Computational Linguistics (COLING 94)*, Kyoto, Japan, August 1994.

Hirakawa, M. 1995. "L2 acquisition of English unaccusative constructions". In *Proceedings*

*of the 19th Boston University Conference on Language Development 1*, D MacClaugh-
lin and S. McEwen (eds), 291–302. Somerville, MA: Cascadilla Press.

Inagaki, S. 1997. "Japanese and Chinese learners' acquisition of the narrow-range rules for
the dative alternation in English". *Language Learning* 47:637–669.

Juffs, A. 1996. *Learnability and the Lexicon: Theories and Second Language Acquisition
Research*. Amsterdam: John Benjamins.

Juffs, A. 2000. "An overview of the second language acquisition of links between verb
semantics and morpho-syntax". In *Second Language Acquisition and Linguistic
Theory*, J. Archibald (ed.), 187–227. Oxford: Blackwell.

Kennedy, J. 1992. *Analyzing Qualitative Data. Log-linear Analysis for Behavioural Research*.
New York: Praeger.

Langacker, R.W. 1987. *Foundations of Cognitive Grammar. Vol.1: Theoretical Prerequisites*.
Stanford, CA: Stanford University Press.

Langacker, R.W. 1991. *Foundations of Cognitive Grammar. Vol.2: Descriptive application*.
Stanford, CA: Stanford University Press.

Levin, B. 1993. *English Verb Classes and Alternations*. Chicago: The University of Chicago
Press.

Ljung, M. 1990. *A Study of TEFL Vocabulary*. [Stockholm Studies in English 78.] Stock-
holm: Almqvist & Wiksell.

Ljung, M. 1991. "Swedish TEFL meets reality". In *English Computer Corpora*, Johansson, S.
& A.-B. Stenström (eds.), 245–256. Berlin: Mouton de Gruyter.

Macleod, C. A. Meyers and R. Grishman 1996. "The influence of tagging on the classifica-
tion of lexical complements". *Proceedings of the 16th International Conference on
Computational Linguistics (COLING 96)*. University of Copenhagen.

MacWhinney, B. (ed.) 1999. *The Emergence of Language*. Mahwah, NJ: Lawrence Erlbaum
Associates.

McEnery, T. 1995. Computational pragmatics: Probability, deeming and uncertain refer-
ences. Unpublished PhD thesis. Lancaster University.

McEnery, T. and Kifle N. 1998. "Non-native speaker and native speaker argumentative
compositions – A corpus-based study". In *Proceedings of First International Sympo-
sium on Computer Learner Corpora, Second Language Acquisition and Foreign Lan-
guage Teaching*, S. Granger and J. Hung (eds). Chinese University of Hong Kong.

Matsumoto, Y., A. Kitauchi, T. Yamashita, Y. Hirano, H. Matsuda, K. Takaoka, M. Asahara
2000. *Japanese Morphological Analysis System ChaSen version 2.2.1*. Online manual
(http://chasen.aist-nara.ac.jp/chasen/doc/chasen-2.2.1.pdf).

Mindt, Dieter 1997. "Corpora and the teaching of English in Germany". In *Teaching and
Language Corpora*, Knowles, G., T. McEnery, S. Fligelstone, A. Wichman (eds),
40–50. London: Longman.

Montrul, S.A. 1998. "The L2 acquisition of dative experiencer subjects". *Second Language
Research* 14 (1):27–61.

Oshita, H. 1997. "The unaccusative trap": L2 acquisition of English intransitive verbs.
Unpublished PhD thesis. University of Southern California.

Pinker, S. 1984. *Language Learnability and Language Development*. Cambridge, MA: Harvard University Press.

Pinker, S. 1987. "The bootstrapping problem in language acquisition". In *Mechanisms of Language Acquisition*, B. MacWhinney (ed.), 399–441. Hillsdale, NJ: Erlbaum.

Pinker, S. 1989. *Learnability and Cognition: The Acquisition of Argument Structure*. Cambridge, MA: MIT Press.

Rohlen, T.P. 1983. *Japan's High School*. Berkeley: University of California Press.

Sawyer, M. 1996. "L1 and L2 sensitivity to semantic constraints on argument structure". In *Proceedings of the 20th Annual Boston University Conference on Language Development*, 2, A. Stringfellow, D. Cahana-Amitay, E. Hughes and A. Zukowski (eds), 646–657. Somerville, MA: Cascadilla Press.

Sekine, S. 1998. Corpus based parsing and sublanguage studies. Unpublished PhD Thesis. New York University.

Slobin, D. 1997. *The Crosslinguistic Study of Language Acquisition. – Vol.: Expanding the Contexts*. Mahwah, NJ; London : Lawrence Erlbaum.

Tomasello, M. 1992. *First Verbs: A Case Study of Early Grammatical Development*. Cambridge: Cambridge University Press.

Tono, Y. 2002. The role of learner corpora in SLA research and foreign language teaching: The multiple comparison approach. Unpublished Ph.D. thesis. Lancaster University.

Toth, P.D. 1997. Linguistic and pedagogical perspectives on acquiring second language morpho-syntax: a look at Spanish *se*. Unpublished PhD thesis, University of Pittsburgh.

Ungerer, F. and H.J. Schmid 1996. *An Introduction to Cognitive Linguistics*. Harlow Essex: Addison Wesley Longman.

White, L. 1987. "Markedness and second language acquisition: The question of transfer". *Studies in Second Language Acquisition* 9:261–286.

White, L. 1991. "Argument structure in second language acquisition". *Journal of French Language Studies* 1:189–207.

Yip, V. 1994. "Grammatical consciousness-raising and learnability". In *Perspectives on Pedagogical Grammar*, T. Odlin (ed.), 123–138. Cambridge: Cambridge University Press.

Zobl, H. 1989. "Canonical typological structures and ergativity in English L2 acquisition". In *Linguistic Perspectives on Second Language Acquisition*, S. Gass and J. Schachter (eds.), 203–221. Cambridge: Cambridge University Press.