The processability hierarchy in second language acquisition: Advanced learners of Japanese as a second language

by

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Abstract

This cross-sectional study investigates, from a processability theory (PT) perspective, a developmental sequence of acquisition of morphosyntactic constructions with advanced learners of Japanese as a second language (L2). Using Lexical Functional Grammar (LFG)-based analysis, this study hypothesizes formal descriptions of a construction that Kawaguchi (e.g., 2007) categorizes as belonging to Stage 5 in the processability hierarchy (PH)—the 'wa' and 'ga' particle distinction in matrix and subordinate clauses. The hypothesized descriptions in the present study suggest that the construction actually belongs to Stage 4. L2 learners were tested to determine whether they sequentially followed the newly hypothesized PH, as PT predicts. Although the results support the newly hypothesized developmental stages, distributional analysis indicates the existence of intra-stages within each stage in PH based on the complexity of form-function mapping, as Mansouri (e.g., 2005) suggests. This study also reveals that Stage 5 still needs to be refined through further LFG-based examination.

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List of abbreviations

ACC	Accusative
ADJ	Adjunct
ADV	Adverb
AP	Adjective phrase
ASP	Aspect
BENE	Benefactive
BSM	Bilingual Syntax Measure
CAUSE	Causative
COS	Canonical order strategy
COMP	Complimentizer
DAT	Dative
DF	Discourse function
DMTH	Developmentally moderated transfer hypothesis
FOC	Focus
HP	Hypothesis space
IL	Interlanguage
IFS	initialization-finalization strategy
GEN	Genitive
HS	Hypothesis space
JLPT	Japanese language proficiency test
LFG	Lexical functional grammar
LMH	Lexical mapping hypothesis
LMT	Lexical mapping theory
L1	First language
L2	Second language
NEG	Negation
NOM	Nominative
NP	Noun phrase
NUM	Number
Ø	Ellipsis
OBJ	Object
OBL	Oblique
OBLag	Oblique agent
PASS	Passive
PH	Processability hierarchy
PL	Plural
POL	Polite
POTEN	Potential
PP	Propositional phrase
PRED	Predicate
PRES	Present
PROG	Progressive

PRON	Pronoun type
PT	Processability theory
SCS	Subordinate clause strategy
SG	Singular
SLA	Second language acquisition
SLOPE	Second language oral production English test
SUBJ	Subject
TOP	Topic
VP	Verb phrase

Chapter 1. Introduction

Researchers who are interested in understanding how people acquire a second language (L2), especially the acquisition of L2 grammatical properties, have been discussing two research topics for decades, a logical problem and developmental problem (e.g., Hawkins, 2001). The first topic, the logical problem, is to account for what makes it possible for L2 speakers to develop mental representations of grammar in the first place. As we often see, the L2 syntactic knowledge that speakers have developed appears to go beyond the properties of input that they have been exposed to, i.e., how do speakers come to know more than presented in the input? The second topic, the developmental problem, is to describe how knowledge of syntax develops over time, i.e., why are some properties acquired earlier than others, and why do some properties remain difficult even for advanced second language speakers? (e.g., Hawkins, 2001).

A number of L2 acquisition researchers who are interested in how knowledge of syntax develops over time, the developmental problem, (e.g., Selinker, 1972; Ellis & Larsen-Freeman, 2006) agree that L2 learners construct the mental representations of a target language, and develop their own dynamic linguistic system, often referred to as 'interlanguage (IL)'. Research has shown that, for any given target language, the system is similar across different learners (e.g., Pienemann & Keßler, 2011). One of the well-known L2 acquisition theories, Monitor Theory (Krashen, 1981, 1982), points out that L2 acquisition is driven by the comprehension of meaningful messages and the interaction between the linguistic information in those messages and the innate language faculty. The natural order hypothesis in Monitor Theory looks at the acquisition sequence of grammar, and posits that the acquisition of grammatical structures, especially morphemes, occurs in a predictable order, often called the natural order of acquisition.

Processability Theory (PT) (Pienemann, 1998b, 2005), a psycholinguistically oriented language acquisition theory, hypothesizes a fixed acquisition sequence of grammatical structures. PT accounts for a universal path of L2 development by outlining levels of language processing procedures, called the processability hierarchy (PH). The hierarchy is formalized by Levelt's speech generation model (Levelt, 1989) and lexical functional grammar (LFG) (e.g., Bresnan, 2001; Dalrymple, 2001; Falk, 2001). PT has been applied and tested cross-linguistically in many languages, including English, Arabic, Chinese, German, Italian, Swedish, Turkish, and Spanish (e.g., Di Biase & Kawaguchi, 2002; Mansouri, 2005; Zhang, 2005). Kawaguchi (e.g., 1998, 2002) has applied PT to L2 Japanese, and showed that morphosyntactic structures were acquired following the fixed sequence predicted by PT. However, as Kawaguchi (2007, 2009) has addressed, few studies, if any, has focused on advanced learners of Japanese as a L2 from a PT perspective to test the highest stage of the PH, Stage 5. Furthermore, although Kawaguchi (2007, 2009) has hypothesized the 'wa' and 'ga' particle distinction in matrix and subordinate clauses as a morphosyntactic construction that belongs to Stage 5 in the Japanese PH, little research, if any, addresses formal descriptions of the construction, drawing on LFG-based analysis, to formally assign the construction to Stage 5.

This present paper is organized as follows. After this introduction, chapter 2 provides a summarization of the historical overview of L2 acquisition sequence research, including morpheme studies (e.g., Brown, 1973; Dulay & Burt, 1973, 1974), the multidimensional model (e.g., Clahsen, Meisel, & Pienemann, 1983 as cited in Cook, 1993), and the predictive framework (Pienemann's theory) (e.g., Pienemann & Johnston, 1985). This illustrates how PT has developed based on the previous approaches and models.

The next section in the chapter presents the theoretical framework of processability theory (PT) and its important components, Levelt's speech generation model (Levelt, 1989) and lexical functional grammar (LFG) (e.g., Bresnan, 2001; Dalrymple, 2001; Falk, 2001). After having discussed the fundamentals of Japanese grammar, this chapter then synthesizes the literature that has applied PT to L2 Japanese acquisition to contextualize the research questions that the present paper investigates.

After reviewing the S'-procedure in the processability hierarchy (PH) and Japanese grammar of the 'wa' and 'ga' particle distinction in matrix and subordinate (embedded) clauses, chapter 3 hypothesizes LFG-based formal descriptions of the 'wa' and 'ga' particle distinction in matrix and subordinate (embedded) clause construction to determine whether the hypothesized construction belongs to Stage 5 as Kawaguchi (2007, 2009) posits.

Chapter 4 introduces the method employed for the present study to test the validity of the newly hypothesized Japanese PH. This chapter includes descriptions of the type of data, participants' information, the speech elicitation procedure, utilized instruments, emergence as an acquisition criterion, and the distributional analysis procedure.

Chapter 5 reports and discusses the results of the cross-sectional research, based on the acquisition criteria and the data analysis procedure. This chapter presents and discusses the results of the distributional analysis based on the newly hypothesized PH, with a focus on morphosyntactic constructions that belong to the S- and S'-procedures (Stage 4 and 5), especially the 'wa' and 'ga' particle distinction in matrix and embedded clause construction.

The final chapter concludes this paper with a summarization of major findings of the research to present theoretical and pedagogical implications of this study as well as practical

applications of them. This chapter ends with a discussion of limitations of the study and suggestions for future research.

Chapter 2. Theoretical framework and literature review

2.1 Introduction

This chapter presents the theoretical framework of processability theory (PT) (Pienemann, 1998b, 2005), together with an overview of Japanese grammar, synthesizing the literature that has applied PT to L2 Japanese acquisition research. This chapter ends by introducing three research questions that the present paper investigates. (1) What are formal descriptions of the morphosyntactic construction that Kawaguchi (2007, 2009) hypothesizes to belongs to Stage 5, 'wa' and 'ga' particle distinction in matrix and subordinate clauses, in light of LFG-based analysis? (2) In light of the LFG-based analysis, does the morphosyntactic construction actually belong to Stage 5 in the Japanese processability hierarchy (PH) as Kawaguchi (2007, 2009) posits? (3) If so, do L2 learners sequentially follow the hypothesized Japanese PH including Stage 5, as PT predicts?

This chapter is organized as follows: Sections 2.2 and 2.3 briefly provide a historical overview of L2 acquisition sequence research to illustrate how PT has emerged in light of previous approaches and models: morpheme studies (Brown, 1973; Dulay and Burt, 1973, 1974; Krashen, Sferlazza, Feldman, & Fathman, 1976), the multidimensional model (e.g., Clahsen, Meisel, & Pienemann, 1983), and the predictive framework (Pienemann's theory) (Pienemann & Johnston, 1985, 1987a, 1987b as cited in Kawaguchi, 2010). This includes an evaluation of their descriptive and explanatory adequacy as a theory or model of second language acquisition (SLA). Section 2.4 accounts for a framework of PT and its fundamental components, Levelt's speech generation model (Levelt, 1989) and lexical functional grammar (LFG) (e.g., Bresnan, 2001).

Section 2.5 gives an overview of primary Japanese grammar and the literature that has applied PT to L2 Japanese acquisition. Section 2.6 then raises the three research questions identified based on the review of the literature to reveal overlooked parts of the Japanese-specific processability hierarchy (PH). Finally, Section 2.7 summarizes this chapter, which leads to the next chapter that presents the hypotheses.

2.2 Theoretical background

The idea of research on a fixed developmental sequence in L2 acquisition was derived from morpheme studies on first language (L1) acquisition. Research by Brown (1973) examined L1 development, with a focus on the emergence of 14 English morphemes. The study was conducted with three children in preschool over four years. Brown (1973) recorded these children's conversations, with mostly their mothers, every month at their homes. He then analyzed the speech data based on how many times per recording each morpheme appeared in obligatory contexts. The morphemes were considered acquired when they were supplied in over 90 percent of the obligatory contexts in three consecutive recordings. Brown (1973) sequentially organized the points at which these children acquired each morpheme to discover an order of their acquisition. He then averaged these orders for each of the children to hypothesize a common sequence for L1 acquisition. The results suggested the following common sequence in the acquisition of 14 English morphemes: 1) present progressive; 2-3) in, on; 4) plural; 5) past irregular; 6) possessive; 7) uncontractible copula; 8) articles; 9) past regular; 10) third person regular; 11) third person irregular; 12) uncontractible auxiliary; 13) contractible copula; and 14) contractible auxiliary. Dulay and Burt (1973) adapted this study to L2 acquisition research to investigate a developmental sequence of grammatical morphemes in L2 English.

2.3 Brief history of L2 acquisition order research

L2 acquisition order research, initiated by Dulay and Burt (1973), has a long history. The research paradigm has evolved by looking at various aspects of language (e.g., morphology and syntax) from various perspectives (e.g., contrastive, error, textual analysis and psycholinguistics). The following section provides a brief history of L2 acquisition sequence studies, and discusses major theories and models (i.e., morpheme studies, the multidimensional model, and the predictive framework) that impact on the emergence of processability theory (PT). This includes a theoretical framework and explanatory principles of these theories and models.

2.3.1 Morpheme studies

Research by Dulay and Burt (1973) investigated L2 learners' developmental sequence of eight morphemes in L2 English. They collected speech samples from 151 Spanish-speaking children, aged six to eight, learning English as a L2 in the USA. They used the Bilingual Syntax Measure (BSM)—a language test that assesses a level of structural proficiency in English and Spanish. The test elicited these morphemes by asking the L2 learners 33 questions about a serious of seven cartoon pictures. They scored each morpheme on a three-point scale: a missing morpheme = 0, an ungrammatically formed morpheme = 0.5, and a correctly formed morpheme = 1. Dulay and Burt (1973) averaged these scores to see a proportion out of 1.00 for each morpheme. They then sequentially organized these scores to have a scale ranging from morphemes supplied most often to those supplied least often. The results suggested the following common sequence of acquisition for certain grammatical morphemes in L2 acquisition: 1) plural; 2) –ing (progressive); 3) copula; 4) article; 5) auxiliary; 6) irregular past; 7) third person singular; and 8) –'s (possessive).

Research further investigated the acquisition of English morphemes with learners from differing L1 backgrounds (Dulay & Burt, 1974). They compared the oral performance of 60 Spanish and 55 Chinese children learning English as a L2 using the BSM. The results suggested the following common acquisition order of the morphemes for both of the groups of L1 learners: 1) –ing (progressive), 2) plural and copula, 3) auxiliary and articles, 4) irregular past, and 5) regular past, third person singular and –'s (possessive). Bailey, Madden, and Krashen (1974) replicated Dulay and Burt's research with 73 adult speakers from various L1 backgrounds (i.e., 33 L1 Spanish speakers and 40 speakers from differing L1, such as Greek, Turkish, Italian, Japanese, Chinese, and Arabic). Their results also suggested a common acquisition order regardless of their different L1s, and the acquisition order was similar to the one suggested by Dulay & Burt (1974),

Research by Krashen, Sferlazza, Feldman, and Fathman (1976) tested acquisition of English morphemes with 66 adult L2 learners from different L1s drawing on the Second Language Oral Production English Test (SLOPE)—a language test of oral production using 20 English structures. The results showed a similar acquisition sequence pattern to the one by Bailey, Madden, and Krashen (1974) regardless of L1. This suggests that certain similarities exist in the language acquisition process between L1 and L2, as well as children and adult learners.

Despite their contributions to L2 acquisition research, a number of studies criticized these morpheme studies mostly because of the methods that the studies employed, such as unsuitable criteria for acquisition (based on accuracy of morpheme production). Most importantly, morpheme studies did not pay attention to theoretical explanations for a common sequence of

acquisition, namely what makes acquisition occur, i.e., a property theory, and why acquisition of morphemes follows a specific order, i.e., a transition theory (e.g., Gregg, 2005).

2.3.2 Multidimensional model

The multidimensional model was designed by Clahsen, Meisel, and Pienemann (1983 as cited in Cook, 1993) based on further examinations of the morpheme studies to predict L2 acquisition sequence. The model highlighted two significant aspects of L2 development: a fixed development sequence that is unaffected by individual and environmental differences, and variation features that respond to individual and environmental differences. The fixed developmental sequence is based on the learner's language processing capacity. The variation features depend on learner variables, such as the learner's psychological orientation toward simplification of grammar.

2.3.2.1 Developmental features

The multidimensional model proposes that features observed in L2 learners' production reveal an interlanguage (IL) developmental process because all L2 learners follow developmental stages in a fixed order. Research studies conducted in the research group project, called ZISA, supported the claim (Clahsen et al., 1983; Meisel et al., 1981; Pienemann, 1980 as cited in Cook, 1993). Both adult and child learners of German as a L2 showed five distinct stages during their development. New 'word order rules' were sequentially accumulated in each of these five stages (Clahsen et al., 1983; Meisel et al., 1981; Pienemann, 1980 as cited in Cook, 1993). Each of these stages is realized as combinations of the three 'speech-processing strategies': (1) canonical order strategy (COS), (2) initialization-finalization strategy (IFS), and (3) subordinate clause strategy (SCS). L2 learners who employ COS strictly use a canonical order, while L2 learners

who employ IFS place additional elements (e.g., adjuncts) at the initial or final position in a sentence. L2 learners who utilize SCS avoid using a subordinate clause (Clahsen, 1987 as cited in Kawaguchi, 2010).

The structure of sentences becomes more complex as the L2 learner progresses through each of the five stages. The degree of re-ordering and re-arrangement of linguistic elements in a sentence, which involves a mapping process of underlying meanings onto surface linguistic forms, determines the psychological complexity of the sentence structure (Clahsen, 1984 as cited in Kawaguchi, 2010; Pienemann, 1998a). Thus, L2 learners initially utilize these strategies (COS, IFS, and SCS) to process psychologically simple speech (i.e., produce sentences with fewer re-orderings and re-arrangements of linguistic elements) because these strategies ease the mapping process by precluding an appearance of possible complex sentence structures (i.e., structures that require more re-orderings and re-arrangements of linguistic elements in sentence). L2 learners then gradually stop using them to process complex sentences as they progress through each stage. In other words, L2 learners have to abandon these strategies in later developmental stages to process a psychologically complex structure because these strategies simplify their sentence processing, as well as constraining (or restricting) complex sentence structure to be processed.

L2 German acquisition research by Clahsen (1984 as cited in Kawaguchi, 2010) suggested the following five stages based on the three strategies. An initial stage is Stage X (+COS; +SCS) in which L2 learners do not require any grammatical knowledge of the target language. They process a sentence only in a canonical order; therefore, the semantic information is directly mapped onto surface linguistic forms. In the second stage, Stage X+1 (+COS; +IFS; +SCS), L2 learners add the strategy IFS to the two strategies, COS and SCS. L2 learners in the stage tend to use an adverb as a preposition because it does not interrupt a canonically ordered

sentence (English examples: ***Yesterday****, I went to school or I went to school* ***yesterday***). The IFS strategy allows the L2 learners a required movement for an adverb as a preposition (i.e., movement of an element from one salient position to another). L2 learners next acquire the so-called 'verb separation' structure in the third stage, Stage X+2 (–COS; +IFS; +SCS). L2 learners move a verb located in a non-salient position (i.e., neither non-initial nor final position in the sentence) to a salient position, such as [V in SV or OV] in German. In other words, the movement interrupts a canonically ordered sentence. The abundance of COS, strict use of a canonical order, allows the interruption. L2 learners at the fourth stage, Stage X+3 (–COS; –IFS; +SCS), process an internal movement (e.g., inversion of subject and inflected verb; English example: ***You are*** *home.* → ***Are you*** *home*?*).* Since the IFS strategy has been abandoned, the internal movement is allowed to occur. Such grammatical rules, inversion of subject and inflected verb, are language-specific; therefore, grammatical knowledge of German (a specific language) is a prerequisite to processing such movements. Finally, in Stage X+4 (–COS; –IFS; –SCS), L2 learners process subordination (i.e., movement of verb to a final position in subordinate clause) because L2 learners at the stage recognize a distinction between a subordinate and main clause. In addition, L2 learners have abandoned all of these strategies at the stage (Clahsen, 1984 as cited in Kawaguchi, 2010). Table 1, below, illustrates these stages in German as a L2.

Table 1. Stages in GSL and processing strategies (Based on Pienemann, 1988a).

	Word order rule	Strategies
Stage X	SVO (canonical order)	+COS; +SCS
Stage X+1	ADV (adverb preposing) initial/finalization	+COS; +IFS; +SCS
Stage X+2	SEP (verb separation) disruption with canonical order and movement to a salient position	–COS; +IFS; +SCS
Stage X+3	INV (inversion) internal movement	–COS; –IFS; +SCS
Stage X+4	V-END (verb-end) subordinate-categorization	–COS; –IFS; –SCS

Note. COS: canonical order strategy; IFS: initialization/finalization strategy; SCS: subordinate clause strategy (avoid using a subordinate clause).

2.3.2.2 Variation features

L2 learners show variation features in their interlanguage (IL) even though they follow the same developmental stages. These variation features can be affected by several factors. The multidimensional model posits that these variation features are related to learners' psycho-sociological orientation towards a target language. Research by Meisel, Clahsen, and Pienemann (1981) has suggested that L2 learners tend to utilize a target language accurately when focusing on their integration to the target language group. However, L2 learners tend to simplify a target language when focusing on successful communication with the language group. This indicates that L2 learners' language use varies depending on their psycho-sociological orientation towards their target language. In other words, they change the degree of simplification in their target language use depending on their psycho-sociological context. In addition, psycho-sociological orientation impacts on learners' preference (i.e., how much simplification they employ when using their target language in a particular context).

Since, according to the model, the developmental features and variation features are independent of each other, L2 learners follow the fixed developmental stages along with the variation features that are an accumulation of their individual differences and psycho-sociological orientations.

2.3.2.3 Teachability hypothesis

Pienemann (1984, 1988b) proposed the teachability hypothesis based on his application of the multidimensional model to German as a L2. The hypothesis claims that grammatical instructions do not change a L2 learner's acquisition sequence of grammatical structures because L2 learners cannot skip any of the developmental stages hypothesized by the multidimensional model. Research tested the hypothesis on 10 Italian-speaking children learning German as a L2 (Pienemann, 1984). They were at developmental stages ranging from Stage X to Stage X+2. These children received grammatical instructions of structures at Stage X+3. The results showed that only those who were at Stage X+2 successfully transferred the learnt knowledge into their Stage X+3 level speech productions. On this basis, Pienemann (1988b) claimed that grammatical instructions promote L2 learning only when an L2 learner's interlanguage is ready to acquire instructed structures.

The multidimensional model has also received criticisms. For example, the model does not provide information about how L2 learners overcome (or abandon) the constraints (i.e., strategies) to move to the next stage. In addition, the model does not sufficiently account for the characteristics of variation features (Larsen-Freeman & Long, 1991). Most importantly, the model has been criticized for the use of these speech-processing strategies as an explanatory principle because researchers (e.g., Kaplan & Bresnan, 1982; Pinker, 1984; Levelt, 1989) have suggested that the transformational approach is psychologically implausible in several formal

grammatical frameworks, such as Lexical functional grammar (Kaplan & Bresnan, 1982; Bresnan, 2001) (Pienemann, 1998b, 2005).

2.3.3 Predictive framework (Pienemann's theory)

Pienemann and Johnston (1985, 1987a, 1987b) are the first researchers who applied the multidimensional model to a language other than German as a L2. They applied the multidimensional model to English as a L2. However, they rejected the transformation-based speech processing strategies. They instead proposed a new predictive framework using a set of universal speech processing constraints to explain the implicational order of L2 acquisition. This theoretical framework initiated a shift in research from the multidimensional to processability theory (Pienemann, 1998b)

Research studies by Johnston (1985 as cited in Kawaguchi, 2010) cross-sectionally and longitudinally looked at the interlanguage development of L2 English on 12 Polish and 12 Vietnamese immigrants in Australia. The results suggested that these L2 learners followed a fixed order of acquisition of grammatical structures regardless of their L1 background, and their acquisition of modal verbs also followed a common sequence. In addition, Pienemann and Johnston's (1985) study on English as a L2 showed that the predictive framework can be utilized to examine acquisition of not only syntax, but also morphology. Tables 2 and 3, below, show the developmental stages in English as a L2. The following are the main characteristics and underlying principles of each stage of English as a L2, based on the work of Pienemann and Johnston (1987b) and Pienemann, Johnston, and Brindley (1998):

Stage 1: The first stage of learning English as a L2 is characterized as the 'pre-syntactic' stage. L2 learners only produce single words and formulaic expressions. They do not know or use any

target grammar or lexical category. They do not know or use any morphological variations of nouns and verbs either.

Stage 2: L2 learners start producing strings of words at this stage. Word order in the string is only canonical (i.e., SVO). They also use the canonical word order as an interrogative with rising intonation. They also start using lexical variations, such as verbal morphology (-ing). However, the morphological operation of (-ing) does not indicate their assignment of an aspectual property to the verb. The operation simply shows that the L2 learners realize that the linguistic element is a verb.

Stage 3: L2 learners realize conceptually salient positions, at the beginning and the end of a sentence. They then add an element to these positions in this stage. (e.g., topicalization or fronting of elements, such as 'do', Wh-interrogative word, or adverb). In addition, they distinguish main lexical categories (e.g., verb, noun, etc.), leading them to gradually use morphology to assign conceptual features (e.g., past or plural) to verbs and nouns.

Stage 4: L2 learners identify a non-salient part of a string of words (i.e., a middle position in the string) in the stage. In addition, they invert an element from an initial to a middle position, such as 'Yes/No inversion'. For instance, in *Have you seen him?*, the auxiliary *Have* and the subject pronoun *you* are inverted to form an interrogative. They also produce a 'local morpheme' at this stage. A local morpheme requires a mapping process between a lexical head and its modifier to form a phrase (e.g., NP). For instance, insertion of plural (-s) in NP, such as *two dog**s*** requires such an operation.

Stage 5: L2 learners realize all elements in a string of words, and place an element in both an initial and internal position of the string at this stage. That means, they can perform two linguistic operations in a string. For instance, they produce a structure, the so-called 'do-2nd'

(e.g., they place a WH-interrogative word at the initial position, and then insert 'do' in the second position of the string). They order these elements accordingly without any restrictions.

L2 learners also produce 'non-local morphemes' at the stage. For example, third person singular (e.g., (-s)) on verb, and adverb (-ly) are nonlocal morphemes. L2 learners unify different information at the sentence level to produce these morphemes (e.g., information about lexical categories and elements in various positions in a string). This indicates that the information from subject and verb have to match at the sentence level for the third person singular (-s) on the verb. Similarly, they need to realize a different realm of modification for ADV (-ly) (i.e., if an ADV modifies ADJ, VP, or the whole sentence).

Stage 6: L2 learners identify a subordinate clause in a string of words at this highest stage. For example, they perform the so-called 'cancel inversion' in an indirect question structure. In the following sentence, *I wonder* ***where she is*** *going*, they cancel an inversion triggered by '*where*' in the subordinate clause to keep it as '*she is*'. The tables 2 and 3, below, illustrate these 6 stages, with examples.

Table 2. Stages in ESL acquisition: Syntax (based on Pienemann, 1995; Kawaguchi, 2010).

	Syntax	**Examples**
Stage 6	Cancel inversion	I wonder where she is.
		I asked her where he is from.
Stage 5	Do second	Why did she say that?
	Aux second	Where have you lost?
	Neg - Do second	He does not like it.
Stage 4	Y/N inversion	Have you seen her?
	Copula inversion	Is he at home?
	Particle shift	Where is she?
		Turn the light on.
Stage 3	Topicalization	Soccer I like
	Do fronting	*Do he live here?
	Adverb fronting	*Today she stay here.
	Neg + Verb	*He don't ask.
Stage 2	Neg + SVO	You live here?
	SVO?	*Mike drink water
	SVO	
Stage 1	Single Words	Hello
	Formulaic sequences	Thank you.
		How are you?

Note. [*] indicates an ungrammatical sentence.

Table 3. Stages in ESL acquisition: Morphology (based on Pienemann, 1995; Kawaguchi, 2010).

	Morphology	**Supplied**	**Over supplied**	**Not supplied in obligatory context**
Stage 6	No morphological operations in the stage			
Stage 5	Third person singular (e.g., -s/es)	He eats	*He is eats	*He eat
	Adverb (e.g., ly)	Walk slowly	*fastly	Walk slow
Stage 4	Possessive (-'s)	Pat's cat	*He saw Pat's	*Pat cat
	Plural (-s)	Two cats	*a cats	*Two cat
Stage 3	Past (-ed)	She cried	*She goed	*Yesterday, he study
Stage 2	-ing	Going	*wenting	---
	Generic –s	Dogs are cute	---	*Dog is cute
Stage 1	Single Words	Hello	---	---
	Formulaic sequences	Thank you.		

Note. [*] indicates an ungrammatical sentence. [---] indicates "not applicable".

Johnston (2000) examined the evolution from the multidimensional model to the predictive framework using his own corpus data and an additional postscript. He raised three evolutionary points:

1) The multidimensional model considers learners' language developmental sequence to be the result of a gradual removal of constraints (COS; IFS; SCS). However, the predictive framework views the acquisition order as the result of an accumulation of language

processing procedures in a fixed sequence. Each stage must be completed sequentially; a L2 learner cannot skip a stage.

2) The multidimensional model deals with only the acquisition of word order (i.e., syntactic operations). However, the predictive framework accounts for acquisition stages of morphology as well.

3) The multidimensional model describes the L2 acquisition sequence using a transformational account, while the predictive framework attempts to use a non-transformational account.

In sum, the predictive framework employs the notion of (grammatical) information exchange between constituents to formalize the process of L2 sentence production. The framework claims that language development is based on processing prerequisites. These developmental stages are the result of sequentially accumulated procedural skills; therefore, all stages must be completed sequentially.

Despite the expansion of the theory and its description, the predictive framework has received criticism, such as falsifiability and inconsistency of the theoretical principles (Larsen-Freeman & Long, 1991; Kawaguchi, 2010). The predictive framework does not allow falsifiability to distinguish between prefabricated morphemes and productively formed morphemes. Such morphemes discussed in the productive framework could appear as prefabricated morphemes without information exchange, as various L1 and L2 acquisition research has suggested (e.g., Wood, 2002, 2006). L2 learners might store whatever string of morphemes that they have seen or heard of before in their mental lexicon as a 'word', and use it as though they have exchanged the grammatical information between the morphemes (Wood, 2002, 2006). However, the predictive framework does not have an analytical tool to differentiate these two types of morphemes. In addition, Kawaguchi (2010) has criticized the fact that

although the predictive framework claims to reject the transformational account because the account is psychologically implausible, it still utilizes the notion of movement in its explanatory principles.

However, theoretical explanatory principles in the predictive framework appear to be promising as a L2 acquisition theory in spite of those shortcomings. Pienemann (1998b) conducted further investigations of the multidimensional model and the predictive framework. He then proposed the processability theory to account for the acquisition sequence of grammatical structures using the architecture of human language processing and its constraints.

2.4 Processability theory (PT)

The processability theory (PT) (Pienemann, 1998b, 2005) is designed, based on further analyses of the multidimensional model and the predictive framework, to predict an acquisition sequence of grammatical structures using a 'linguistic processor' and its architecture. PT proposes that spontaneous production of L2 sentences can only occur within the linguistic processor's capacity. In other words, L2 learners only produce L2 sentences that the learner's current linguistic processor can deal with. On this basis, PT predicts, regardless of language, L2 learners' developmental sequence of grammatical structures in light of the linguistic processer's architecture—levels of language processing.

2.4.1 Language processing skill and L2 development

L2 development includes acquisition of procedural (i.e., automatized) skills to process grammatical information in real time in L2 (Pienemann, 1998b). A number of psycholinguistic researchers (e.g., Anderson & Lebiere, 1998; Levelt, 1978, 1989; Logan, 1988; McLaughlin, 1987; Segalowitz, 2010) consider L2 acquisition to be a gradual accumulation of procedural

cognitive processing. Procedural cognitive processing is fast, independent of the amount of information processed, and has no involvement with conscious awareness of processing. The amount of attention/effort to process grammatical information in L2 decreases as learners' cognitive processing skill for L2 production increases (Segalowitz, 2010). In other words, the information processing for L2 production becomes automatized (i.e., proceduralized) through learning.

Anderson's adaptive control of thought (ACT), a cognitive architecture developed by Anderson and Lebiere (1998), assumes that learning of skills involves a transition from a stage characterized as 'declarative knowledge' to another stage categorized as 'procedural knowledge'. Declarative knowledge, sometimes referred as 'knowing that', relates to consciously known contents and information (e.g., explicit knowledge that you have about how to form a particular grammatical construction in L2), while procedural knowledge, sometimes referred as 'knowing how', relates to non-conscious knowledge of how to do things, which is related to performance of skilled behaviour (e.g., implicit knowledge that most native speakers have about how to correctly form a number of grammatical constructions in L1). Transformation of declarative knowledge into procedural knowledge occurs with repeated recalls and uses of the skill. This transition process is called 'automatization or proceduralization' (Anderson & Lebiere, 1998). The transition starts with a cognitive stage in which rules are explicit, and then passes through an associative stage in which these rules are repeatedly applied in a consistent manner. Finally, the transformation arrives at an automatized stage in which these rules are not explicit anymore. Therefore, applications of these rules take place automatically, implicitly in a fast and coordinated way, and allow for attention to be directed elsewhere to permit multiple psychological processing events to occur simultaneously.

From a PT perspective, L2 learners cannot process the grammatical information in real time because they have not yet acquired the prerequisite procedural (i.e., automatized) processing skills to process a given information (Pienemann, 1998b). On this basis, PT posits a hierarchy of the procedural processing procedures to predict a fixed acquisition sequence of the information processing skills. The hierarchy is called the processability hierarchy (PH).

The architecture of the PH is based on fundamental concepts of Levelt's speech production model (Levelt, 1989) and Lexical Functional Grammar (LFG) (e.g., Bresnan, 2001; Falk, 2001). The PH entails two crucial procedures based on Levelt's speech production model and LFG (Pienemann, 1998b, 2005):

1) Transferring grammatical information in a sentence during language production using working memory

2) Mapping processes of the information involved in connecting constituents, semantic roles and grammatical functions.

2.4.2 Levelt's speech generation model

One of the important components of PH, Levelt's speech generation model (Levelt, 1989), posits that an intended message is generated in a 'Conceptualizer'. The message is then delivered to a 'Grammatical encoder' to operate grammatical and phonological coding using lemmas, an abstract conceptual form of a word, retrieved from the lexicon. Overt speech is then produced through the 'Articulator'. The figure 1, below, illustrates the speech model.

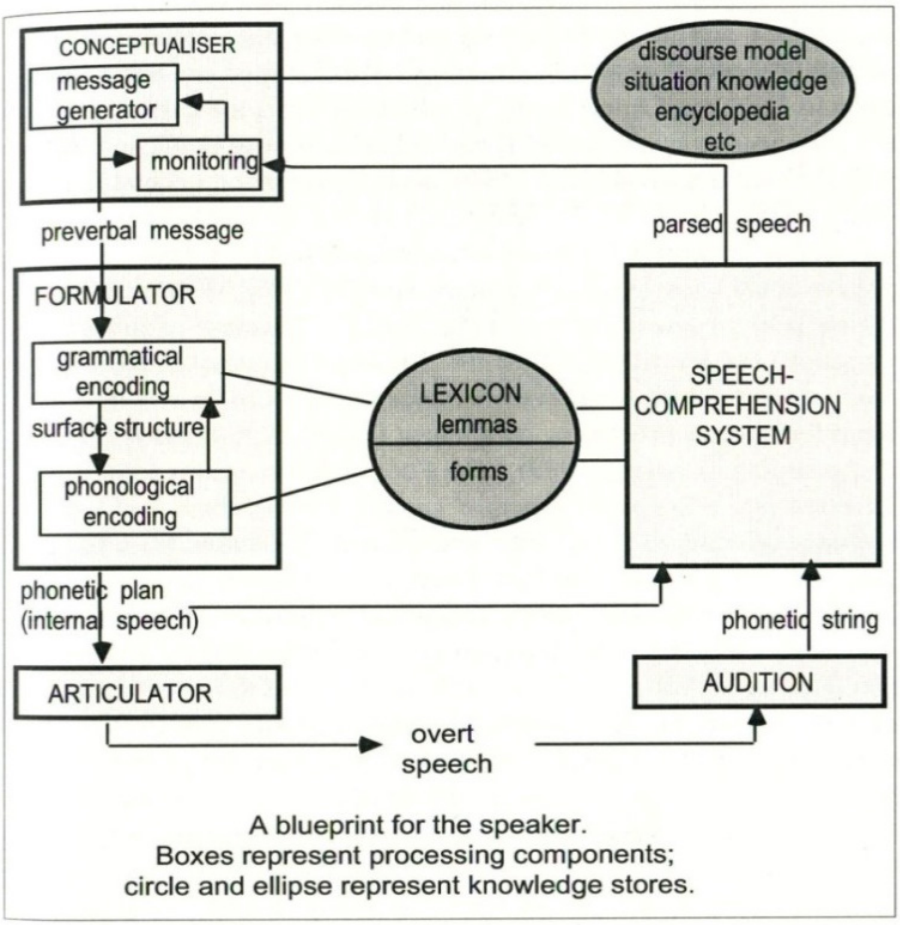


Figure 1: Levelt's speech generation model (taken from Levelt 1989, p. 32).

Pienemann (1998a, 1998b) adopted four important psycholinguistic assumptions from Levelt's model:

1. Processing components (such as the Formulator, the Grammatical Encoder and the lexicon) are relatively autonomously specialized and operate largely automatically
2. Processing is incremental
3. The output of the processor is linear, while it may not be mapped onto the underlying meaning in a linear way
4. Grammatical processing has access to grammatical memory store.

(Pienemann, 1998a, p. 2)

1. Processing components (such as the Formulator, the Grammatical Encoder and the lexicon) are relatively autonomously specialized and operate largely automatically

The notion is that autonomous operations in parallel with the formulator and the grammatical encoder are necessary for spontaneous language production because if all processing components were coordinated by a central control centre, it would lead to a serial processing procedure and slow processing. These autonomous processing components (i.e., the formulator and the grammatical encoder) are task-specific. Such task-specificity of processing components facilitates their parallel execution, and increases processing speed for spontaneous speech production.

2. Processing is incremental

Grammatical information and lexical forms in a message are gradually constructed simultaneously with conceptualization; the other processors start operating while the current processor is working. In other words, language processing occurs in a parallel manner to produce fluent speech.

3. The output of the processor is linear, while it may not be mapped onto the underlying meaning in a linear way

Overt speech produced through the articulator is not necessarily according to the natural order of events (Levelt, 1989). In other words, the relationship between the natural sequence of events and the order of clauses may show non-linearity, called the linearization problem. The sentence a), below, shows a mismatch between the actual sequence of events and the linguistic formulation of the events. The content of *I ate breakfast* remains in working memory until the articulator outputs the subordinate clause *before going to school*. In addition to the relationship between the natural sequence of events and the order of clauses, 'marking morphology' also displays a different kind of the linearization problem.

a) Before going to school, I ate breakfast.

b) She gives me a book.

In sentence b), the verb 'give' requires the information from the subject 'she' (i.e., third person singular) for its proper inflection. That is, the grammatical annotation of the subject 'she' occurs twice in the sentence (i.e., the information of the subject, third person singular, is assigned to the subject 'she', and to the verb 'give').

4. Grammatical processing has access to the grammatical memory store.

Grammatical information (e.g., person and/or number) needs to temporarily remain in working memory until the information is completely assigned to lemmas, phrases, clauses and sentences. Sentence b) above demonstrates how premise (4) works as well. As discussed, in sentence b), the information of the subject is assigned twice in the sentence when both the subject 'she' and the verb 'give' are generated. In sum, the information has to be stored in grammatical memory until it is completely assigned (Pienemann 1998a).

Figure 2, below, exemplifies a process of incremental language generation with the three central components: the conceptualizer, grammatical encoder and lexicon (Levelt, 1989; Kempen & Hoenkamp, 1987). In figure 2, a speaker first produces the basic concepts of the sentence 'A child gives a cat to the mother' in the conceptualizer. The conceptual material then activates the lemma 'CHILD' that consists of the categorical information [N: noun] in the lexicon. The categorical information [N: noun] demands a categorical procedure to build a phrasal category [NP: noun phrase] containing the noun 'CHILD' as head of the noun phrase 'A CHILD'. The number value of the determiner 'A' (singular) and the head noun 'CHILD' (singular) has to match to form a well-formed phrase because the categorical procedure carries the value of these grammatical features to unify them (Pienemann, 1998a).

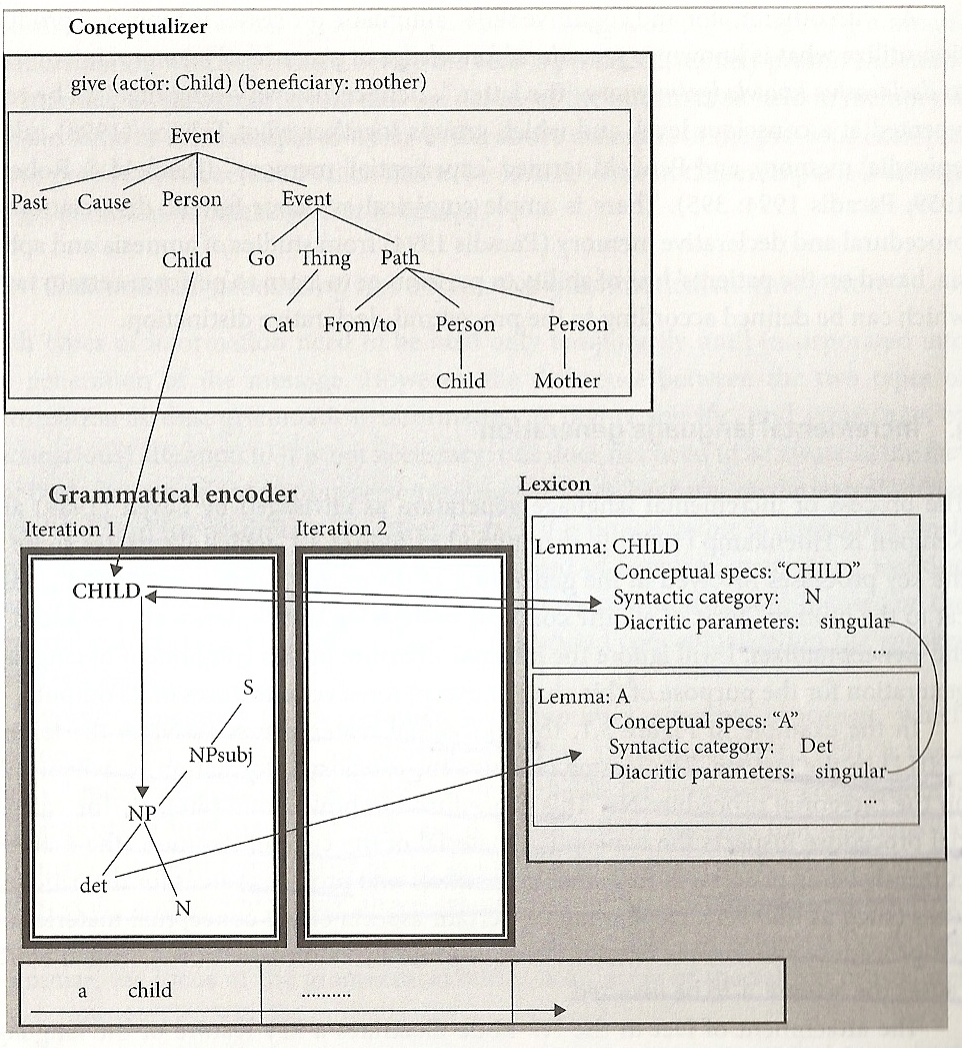


Figure 2: Incremental language generation (Taken from Pienemann, 1998b, p. 68).

Establishment of the relationship between the developed noun phrase 'A CHILD' and the rest of the intended message allows assigning a grammatical function to the noun phrase. In other words, the unification between the noun phrase and the rest of the message needs to occur at the sentence level, i.e., the highest node (mother node) in the tree structure. The sentential procedure, requested by the noun phrase, carries the grammatical features to unify them. This leads to determination of the functional annotation of the noun phrase, (i.e., subject or object). Furthermore, Pienemann (1998b) assumes that the word-order arrangement for configurational

languages, characterized as having a rigid phrase structure, is carried out by word order rules that coordinate the assembly of phrasal sub-procedures. For non-configurational languages, regarded as not having a rigid phrase structure, grammatical roles may be specified directly from semantic roles specified in the conceptual structure (Pienemann, 1998b; Pienemann & Håkansson, 1999).

To summarize, in the incremental process of language generation, processing procedures and routines are activated in the following sequence (Levelt, 1989; Kempen & Hoenkamp, 1987; Pienemann, 1998b):

1. Lemma access;
2. Category procedure (lexical categories of lemmas);
3. Phrasal procedure (activated by the category of the head);
4. S-procedure (sentential procedure) and the target language word order rule;
5. Subordinate clause procedure (if applicable).

2.4.3 Processability hierarchy (PH)

Pienemann (1998b) has proposed the processability hierarchy (PH), a hierarchy of acquisition of processing procedures, in L2 development. The hierarchical sequence follows the same order as the activation of language production processes discussed above. Acquisition of these processing procedures at the lower levels in the hierarchy is a prerequisite for the higher levels. In other words, L2 learners must sequentially complete each stage.

The notion of 'grammatical memory store' and 'exchange of grammatical information' is important in describing the principles of acquisition hierarchy in the PH because PT views L2 acquisition as gradual acquisition of these hierarchical processing procedures (Pienemann, 1998b). Figure 3 exemplifies three levels of information exchange procedures of morphology. No exchange of grammatical information occurs at the category stage. An exchange of

grammatical information takes place within the noun phrase at the phrase stage. Similarly, at the sentence stage, an exchange of grammatical information occurs within the sentence (Pienemann, 2010).

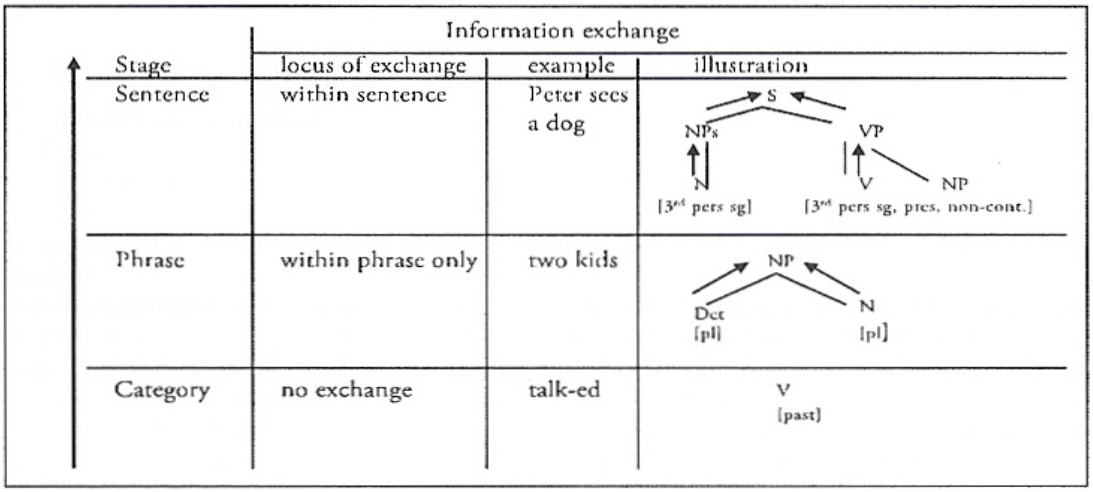


Figure 3: Three levels of information exchange procedures in morphology (taken from Pienemann, 2011)

Table 4, below, shows the five hypothesized developmental stages of processing procedures based on the principles of processability discussed above: word/lemma at Stage 1, categorical procedure at Stage 2, phrasal procedure at Stage 3, S-procedure at Stage 4, and S'-procedure at Stage 5. The following section briefly summarizes these hypothesized (general, non-language specific) structural outcomes of both syntax and morphology at each stage (Pienemann, 1998b).

Table 4. Hypothetical hierarchy of processing procedures (based on Pienemann, 1998b).

	Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
S'-procedure (Embedded S)	-	-	-	-	+
S-procedure (Sentential)	-	Simplified	Simplified (Top-Subj)	+ (inter-phrasal information exchange)	
Phrasal procedure (head)	-	-	+ (phrasal information exchange)		
Categorical procedure (lexical category)	-	+ (lexical morphemes)			
Word or lemma access	+	+	+	+	+

Stage 1 (word/lemma): L2 learners have not yet developed any language-specific processing skill at this stage. Therefore, they cannot access any syntactic information. They only produce L2 single words and formulaic language, not requiring any grammatical information exchange.

Stage 2 (categorical procedure): L2 learners produce lexical morphology at this stage. They also produce sentences in a canonical word order using direct mapping procedures of conceptual structures onto linguistic forms. They also utilize a semantic role of words to canonically order them (i.e., agent-action-patient in a configurational SVO language).

Stage 3 (phrasal procedures): L2 learners produce phrasal morphology at this stage because they can exchange grammatical information between a head and its modifier (e.g., [-s] in 'two cats' in English). In addition, they add a noun phrase or WH-question words to the initial position in a canonically ordered sentence.

Stage 4 (S-procedure): L2 learners use inter-phrasal morphemes (e.g., [-s] in 'he eats' in English) to construct sentences at this stage. They also unify noun phrases that are developed at a

lower node at the S-node (sentence-level node), and assign a grammatical function to the noun phrases at this stage.

Stage 5 (S'-procedure): L2 learners distinguish between a matrix and subordinate clause to accordingly construct a sentence at this stage.

Pienemann (1998b) claimed that the hierarchy of processing procedures based on general psychological constraints (i.e., working memory capacity to transfer grammatical information in a sentence during language production) needs a formal grammar to formally assign grammatical structures to each stage in any language. He, therefore, has employed lexical functional grammar (LFG) (e.g., Bresnan, 2001; Falk, 2001; Kaplan & Bresnan, 1982) because LFG uses key psychological factors involved in language processing for its formalization, and is compatible with psycholinguistic theories, such as Pinker's (1984) learnability theory and Levelt's (1989) speech generation model. The following section describes the foundations of LFG.

2.4.4 Foundations of lexical functional grammar (LFG)

Lexical Functional Grammar (LFG) is a grammatical framework in formal linguistics, and a variant of generative grammar (e.g., Chomsky, 1965). LFG is lexically driven (i.e., non-derivational grammar: it has no notion of deriving one structure from another, such as transformations), and views language as being constructed by three dimensions. Each of the dimensions is represented as a distinct structure with its own rules, concepts, and forms (Bresnan, 2001; Dalrymple, 2001; Falk, 2001). The three structures are:

- **Argument structure (a-structure):** consists of predicates and their arguments (e.g., agent, theme, locative, etc.);
- **Functional structure (f-structure):** specifies grammatical functions of constituents for semantic interpretation (e.g., subject, object, etc.);

- **Constituent structure (c-structure):** consists of hierarchical components and specifies the internal structure of sentences, represented by a 'tree structure'.

Figure 4, below, shows the three parallel components of LFG using an example sentence '*Peter pats a dog*' (Kawaguchi, 2010). Mapping a-structure onto the f-structure and c-structure onto f-structure formalizes the grammatical structure of the sentence (Bresnan, 2001).

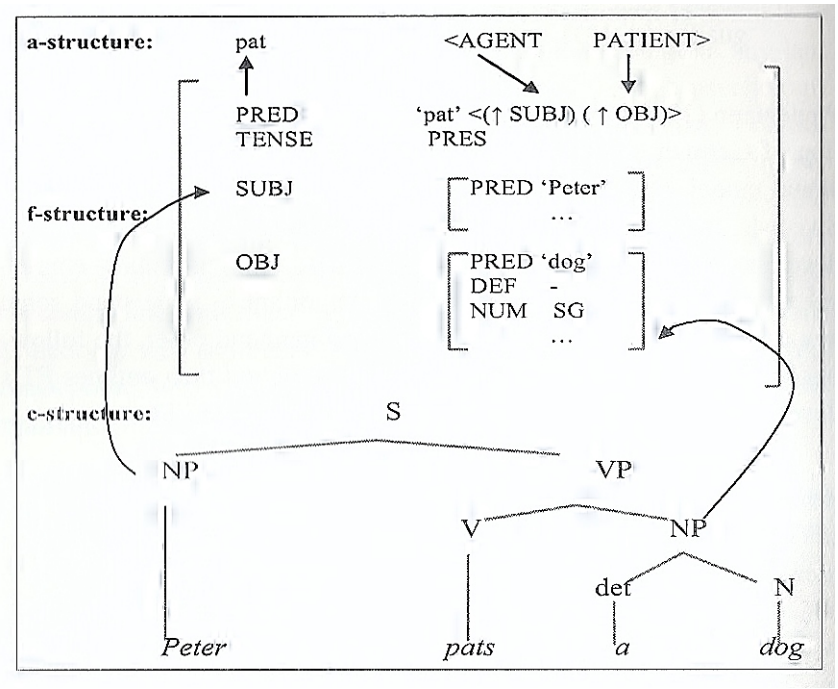


Figure 4: Three parallel structures for the English sentence 'Peter pats a dog' (taken from Kawaguchi, 2010)

Figure 4 shows the predicate '*pats*' and the associated argument roles 'agent' and 'patient' in the a-structure. These arrows indicate the mapping process of the a-structure onto the f-structure as well as the c-structure onto the f-structure. Figure 5, the f-structure of '*Peter pats a dog'* below, exhibits attribute-value matching. Since PRED (predicate) value is assigned to syntactic heads, '*pat*' is realized as the PRED at the sentence level (i.e., it is assumed that the syntactic head in the sentence is the verb). The PRED '*pat*' bears two grammatical arguments:

SUBJ (subject) and OBJ (object). '*Peter*' is realized as PRED in the SUBJ, and bears two values in the secondary f-structure: NUM (number) as SG (singular) and PERSON' as '3'. Similarly, *'dog'* is realized as PRED in the OBJ, and has two attributes: 'DEF (definiteness)' as '–' (indefinite) and 'NUM' as SG.

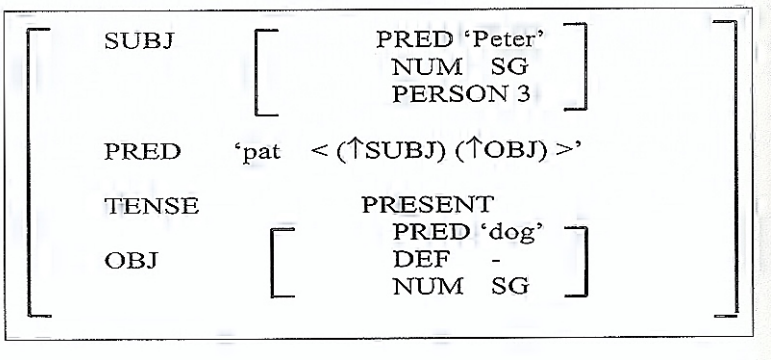


Figure 5: F-structure of 'Peter pats a dog' (taken from Kawaguchi, 2010).

Furthermore, the f-structure needs to satisfy three conditions for 'well-formedness' of a sentence: completeness, coherence, and uniqueness conditions (e.g., Bresnan, 2001; Falk, 2001; Kaplan and Bresnan; 1982).

- **Completeness condition** needs the f-structure to be complete; all of the functions in the f-structure must be fulfilled. Figure 5 satisfies the completeness condition because all the agreements of these predicates, including those in these secondary f-structures, are present.

- **Coherence condition** needs each of the sub-categorisable grammatical functions in the f-structure to be subcategorized by one of the predicates in the f-structure. Figure 5 also satisfies the condition because no additional and unnecessary argument of these predicates is observed.

- **Uniqueness condition** ensures that an attribute of each f-structure has only one value, and each attribute has a unique value. In other words, each f-structure does not have two different values.

2.4.4.1 Feature unification

As addressed earlier, the processability hierarchy (PH) entails two important procedures based on LFG: transferring grammatical information in a sentence during language production using working memory, and the mapping process of the information involved in connecting constituents, semantic roles and grammatical functions. Feature unification is one of the essential procedures that the PH uses (Pienemann, 1998b, 2005). Since LFG is lexically driven, grammatical information (i.e., features in the f-structure) of morphemes at each terminal node in the c-structure comes from the lexical entry of each morpheme (Pienemann, 1998b, 2005). Figure 6, below, shows the information flows (represented by [↑] and [↓]), functional annotations, and lexical entries of each morpheme in the sentence '*Peter pats a dog*'. The information from each node elevates along with the tree branches and arrives at the mother node. The uniqueness condition 'checks' the information met at the mother node (sentence-level node) if they conflict. This is because, according to the uniqueness condition, an attribute of each f-structure has only one value (if they conflicted, an attribute of the f-structure would have two different values, which violates the uniqueness condition). If they do not conflict, these features are unified, called the feature unification. Figure 6, below, illustrates feature unification. The lexical entry of '*Peter*', NP/SUBJ, bears the information of SG and 3. The information elevates, as represented by up-arrows, to the mother node. The lexical entries of the verb '*pats*' also consist of the information of SUBJ/NUM as SG and SUBJ/PERSON as 3. Since these grammatical features from '*Peter*' and '*pats*' are compatible, feature unification occurs at the S-node (sentence-level).

Feature unification also occurs at a phrasal level, such as ‘a*’* (NUM as SG (singular) and ‘*dog*’ (NUM as SG)’ in ‘*a dog’* as seen below.

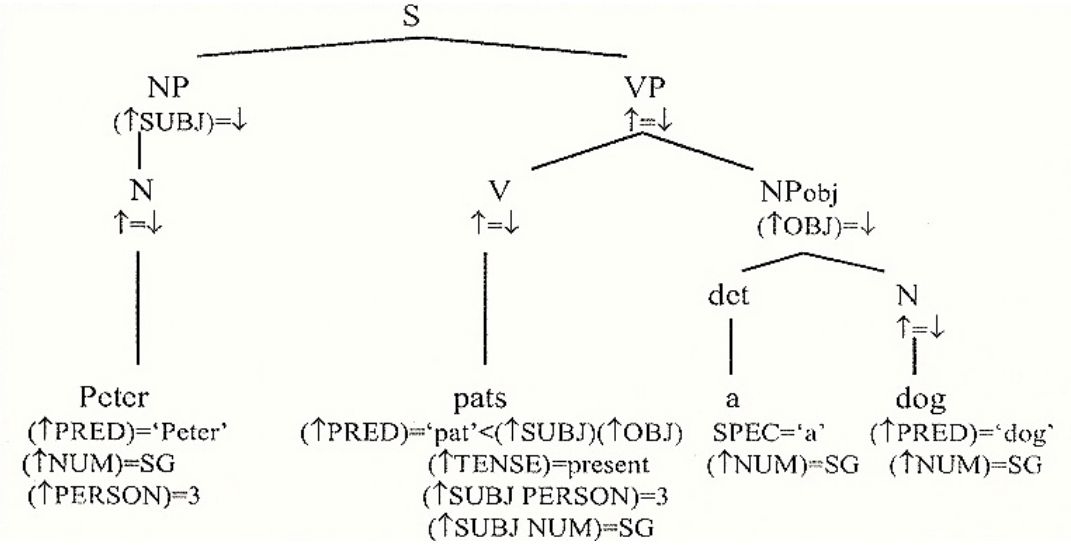


Figure 6: C-structure of ‘Peter pats a dog’ and its lexical entries (taken from Kawaguchi, 2010)

2.4.4.2 Lexical mapping theory

In addition to the feature unification, another important procedure that PH employs to formalize the transfer and the mapping process of grammatical information is called ‘lexical mapping’. LFG operates lexical mapping by connecting a-structure to f-structure, as seen in Figure 4. This is called ‘lexical mapping theory’ (LMT) (e.g., Bresnan, 2001). A fundamental concept of LMT is that a specific thematic role (such as agent, patient, etc.) can be expressed by means of a different grammatical function. For instance, sentences (i) and (ii), below, have the same participants involved in the same event. The ‘*cat*’ (thematic role is ‘theme’) in sentence (i) is grammatically realized as OBJ, but the ‘*cat*’ (thematic role is also ‘theme’) in sentence (ii) is grammatically realized as SUBJ (Pienemann, 2005, 2007).

(i). Peter sees the cat.
sees [experiencer, theme]
| |
SUBJ OBJ

(ii). The cat is seen by Peter.
seen [theme (experiencer)]
| |
SUBJ (ADJ/OBL)

In addition to passive syntactic structure, causative construction does not map SUBJ onto 'agent' either.

(iii). He makes me cry.
makes [agent, patient] cry [agent]
SUBJ OBJ

In sentence (iii), '*makes*' bears '*He*' as [agent/SUBJ] and '*me*' as [patient/OBJ]. In addition, '*cry*' bears '*me*' as [agent/OBJ] as well. In consequence, a number of contexts in which 'agent' is not mapped onto SUBJ of sentence could occur. This suggests that the meaning of a sentence can be expressed in various manners, and the relationships between arguments and their grammatical functions are not linear (Pienemann, 2005). In light of this, LMT views these semantic roles as hierarchically based on a universal hierarchy of thematic roles (e.g., Jackendoff, 1972, 1990). The hierarchy of these argument (semantic) roles in the a-structure follows their relative prominence (i.e., prominence attributes) from left to right in the thematic hierarchy below. The relationship between the thematic hierarchy and processability hierarchy (PH) are discussed in a later section of this paper.

The thematic hierarchy below shows the relative prominence of the semantic roles and their left-to-right order.

Agent > Beneficiary > Experiencer/Goal > Instrument > Patient > Locative

(Bresnan, 2001, p. 307)

LFG contains principles that regulate mapping procedures between c-structure and f-structure as well. According to Falk (2001), since the mapping between c-structure and f-structure copes with the relationship between overt syntactic elements and the features they represent, it is the core of the descriptive power of LFG. For example, a statement sentence in English could begin with NP or PP, and the NP or PP may serve different grammatical functions, such as SUBJ, OBJ, or ADJ. That is, the relationship between c-structure (surface syntactic structure) and f-structure (their grammatical functions) may not be linear either (Pienemann, 2005). Figure 7, below, exemplifies the non-liner relationship between c-structure and f-structure. Grammatical functions also have a hierarchical relationship according to their prominence, as seen below. All core argument functions are more prominent than non-core argument functions.

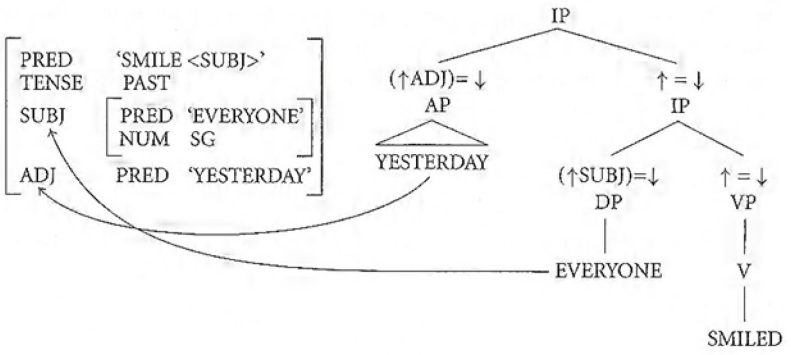


Figure 7: C-structure and f-structure of 'Yesterday everyone smiled' and its lexical entries (taken from Pienemann, 2005)

Relational hierarchy (OBJθ refers to secondary object)

$$\overbrace{\text{SUBJ} > \text{OBJ} > \text{OBJ}\theta}^{\text{core}} > \overbrace{\text{OBJ}\theta > \text{COMP} > \text{ADJUNCT}}^{\text{noncore}}$$

(Based on Keen & Comrie, 1997 as cited in Bresnan, 2001, p. 96)

2.4.5 Unmarked alignment hypothesis

In light of the lexical mapping, the thematic hierarchy, and the relational hierarchy discussed above, Pienemann, Di Biase and Kawaguchi (2005) argue that the mapping of argument, functional, and constituent structures follows a universal hierarchy based on linearity in L2 acquisition. That is, the initial state of the mapping hierarchy is completely linear. Figure 8, below, illustrates a one-to-one thematic role mapping onto grammatical function and fixed constituent. This appears as an initial state of L2 language development because it simplifies and constrains language processing, resulting to form a canonically ordered sentence. The initial state of the mapping hierarchy is called the 'unmarked alignment' in PT. (Pienemann, 2005; Pienemann, Di Biase & Kawaguchi, 2005).

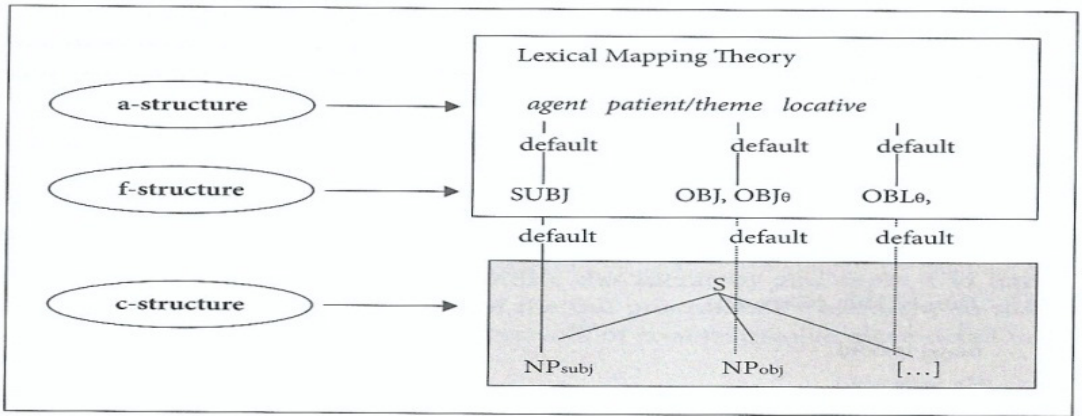


Figure 8: Unmarked alignment (taken from Pienemann, 2005, p. 230)

Furthermore, Pienemann et al, (2005) have proposed two hypotheses based on the unmarked alignment: topic hypothesis and lexical mapping hypothesis.

2.4.5.1 Topic hypothesis

The topic hypothesis focuses on a mapping of c-structure onto f-structure. In the mapping process of c-structure onto f-structure, adding an adjunct to a canonically structured sentence as a DF, discourse function, (e.g., Focus or Topic) generates non-linearity in the c-structure (Pienemann et al, 2005). For instance, English may have a constituent other than NP (e.g., PP and AP) at an initial position in a sentence, as seen Figure 7 above. Furthermore, NP at the initial position in a sentence may not be SUBJ either (e.g., after the discussion of beer and white, and then '*beer, she likes a lot*'). Unmarked alignment cannot handle such non-linearity because it always expects a sentence-initial position to be SUBJ/NP. On this basis, the topic hypothesis claims that, as seen table 5 below, L2 learners initially do not differentiate between SUBJ and TOPIC at a sentence-initial position. Then, when they deal with Wh-words or adjuncts (i.e., focus) at a sentence-initial position (called 'XP' position in PT), they differentiate TOPIC and SUBJ, and see the TOPIC as ADJUNCT at the XP position. Finally, they assign a core argument (other than SUBJ) to NP as TOPIC (e.g., OBJ) at the XP position and see the TOPIC as OBJ.

Table 5. The topic hypothesis (based on Pienemann, 2005).

Discourse principle	c-structure to f-structure mapping	Structural outcomes
Topicalize core arguments	TOPIC = OBJECT	The TOPIC function is assigned to a core argument other than SUBJ.
	↑	
XP-adjunction	TOPIC+ADJUNCT	The initial constituent is a circumstantial adjunct or a focus WH-word. TOPIC is differentiated from SUBJ.
	↑	
Canonical order	SUBJ=TOPIC	TOPIC is not differentiated from SUBJ.

2.4.5.2 Lexical mapping hypothesis

The lexical mapping hypothesis (LMH) concerns non-default mapping of a-structure (i.e., semantic argument roles) onto f-structure (i.e., grammatical function). LMH posits that L2 learners initially map the most prominent thematic role, 'agent', onto the most prominent grammatical function, SUBJ. They then gradually learn how to assign less prominent thematic roles, such as 'patient' and 'theme', to SUBJ (Di Biase and Kawaguchi, 2002). Since non-canonical association of thematic role and grammatical function requires a capacity to process a higher cognitive load, LMH predicts that the non-canonical mapping is acquired in a later stage in PH. Therefore, LMH hypothesizes that a canonical mapping occurs at stage 2 (categorical procedure) because L2 learners utilize direct mapping of a conceptual structure onto a linguistic form; no information exchange occurs between these constituents. This is computationally the least costly way to organize syntax (Pinker, 1984). On the other hand, a non-canonical mapping,

such as passive, causative, and beneficative constructions, occurs at stage 4 (sentence procedure: S-procedure) because identification of phrases' grammatical functions and their functional assignments in those constructions requires L2 learners to unify information from different constituents (from VP and NP). Such mapping processes are seen in sentences (ii) and (iii) above.

2.4.6 Hypothesis space and learner variation

The processability theory (PT) claims that all L2 learners sequentially follow the same stages, the processability hierarchy (PH), in their development; however, it does not mean that they all display exactly the same linguistic features. Rather, PT clams that L2 learners develop a differing style at every level of L2 acquisition. On this basis, PT proposes the hypothesis space (HS) to describe how L2 learners' style links to these PH stages in L2 acquisition. The HS accounts for what kind of linguistic mechanisms allow these different styles to emerge in interlanguage (IL).

PH represents the sequence that L2 learners are constrained to follow based on the fundamental structure of 'the linguistic processor'. The processor develops as L2 learning progresses. HS claims that at the same time there is an allowance for some degree of leeway in the processing procedures developed at each stage of the hierarchy (Pienemann, 1998b). In other words, a 'hypothesis space' is created by the interplay between the PH and the leeway generated at every stage of the hierarchy. Therefore, when L2 learners attempt to produce sentences that require a higher level of information exchange than the learner's current linguistic processor is capable of, they have to deal with the sentences based on the current linguistic processor that is not sufficient to deal with such a high level of information exchange. Consequently, they tend to produce an ungrammatical sentence due to the limited capacity of processing procedures, although they might successfully convey the general intended meaning (Pienemann, 1998b). For

instance, when L2 learners at Stage 3 (information exchange within a noun phrase) produce a sentence with a Wh-word to form an interrogative, since it requires information exchange within the sentence (S-processing procedure; Stage 5), they employ various structural solutions to avoid exchanging the information beyond the phrase boundary. The four sentences below are examples of how they confront target structures that require higher levels of processing procedures. Each example shows how L2 learners delete some grammatical properties, or use non-standard syntax to avoid transferring grammatical information across phrases (Pienemann, 2007).

The grammatically correct sentence is "Where has he been?"

a. *Where he been?
b. *Where has been?
c. *Where he has been?
d. He has been where?

Note. [*] indicates an ungrammatical sentence.
(Pienemann M. , 2007, p. 142)

Furthermore, PT claims that all variable solutions that L2 learners employ are located within PH. This implies that PH contains two dimensions: processing capacity development and individual variation determined by the leeway that a L2 learner has taken as a processing solution each stage. Figure 9 illustrates these dimensions (Pienemann, 1998b, 2005; Pienemann & Keßler, 2011).

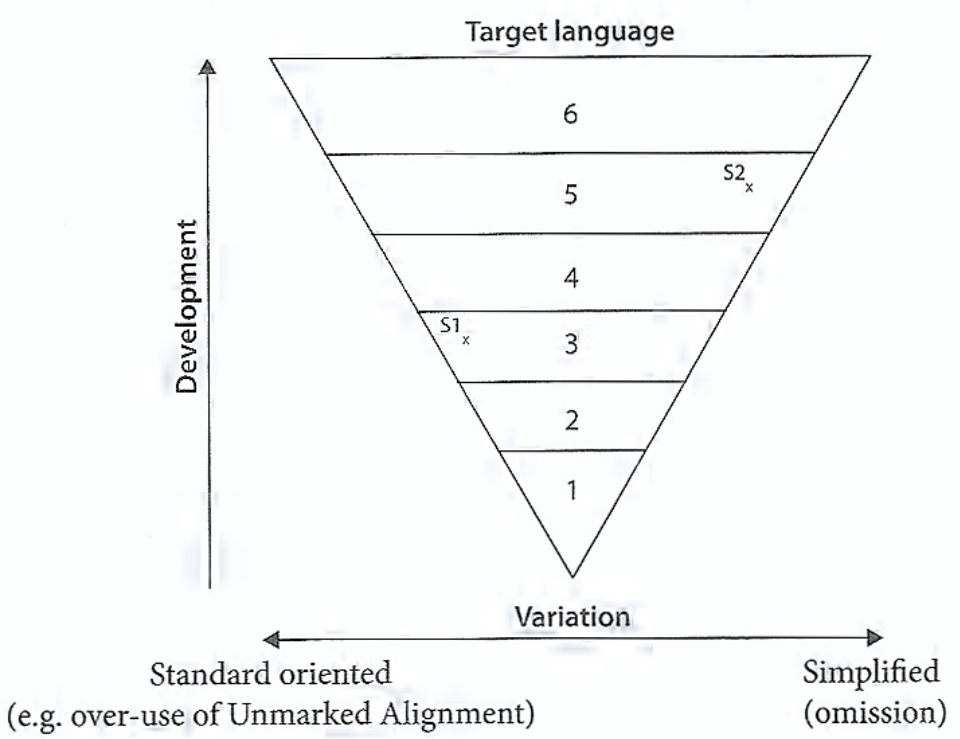


Figure 9: Hypothesis space (taken from Pienemann & Keßler, 2011, p. 38)

Figure 9 shows developmental stages vertically and variation solutions horizontally. The S1 and S2 in the figure show the learner's possible interlanguage (IL) grammar at one point in time. The variation displays two types: simplified solutions (involving omission) on the left and standard-oriented solutions (based on variants of the unmarked alignment) on the right. Since the hypothesis space (HS), Figure 10, permits an individually unique developmental trajectory determined by an accumulation of a learner's solution choice at each stage within one overall system, it captures the dynamics of IL grammar and its development (Pienemann, 1998b, 2005).

The variable solutions selected by a L2 learner at each stage affect later development because these choices will accumulate as the L2 learner's IL develops. Pienemann (1998b) claims, based on re-analyses of Clahsen, Meisei and Pieneman's corpus data (1983), that the IL system stabilizes (e.g., Long, 2003) if too many 'bad' choices have been made, called the 'bad

choice hypothesis'. Pienemann (1998b) has also stated that changing the components of variation strategies to solve processing problems from stage to stage is cognitively far more costly than keeping them. Therefore, it is not easy for L2 learners to switch from utilizing the simplified solution to the standard-oriented solution or vice versa.

2.4.7 L1 transfer

The processability theory (PT) views the role of L1 transfer in L2 development based upon the 'developmentally moderated transfer hypothesis (DMTH)' (Pienemann, 1998b; Pienemann, Di Biase, Kawaguchi, and Håkansson, 2005). The DMTH claims that L2 learners only transfer what they can process; that is, L2 learners transfer L1 grammatical structure to L2 grammar structure when they acquire a procedural processing skill in L2 to process a particular L1 grammatical structure. This means the DMTH constrains L1 transfer until L2 learners are developmentally ready for a particular structure of L1 in L2. Learners' L2 linguistic processor facilitates the transfer of L1 grammar to L2 when learners are ready. Figure 11 illustrates the DMTH (Lx = an additional L1, Ly = L2).

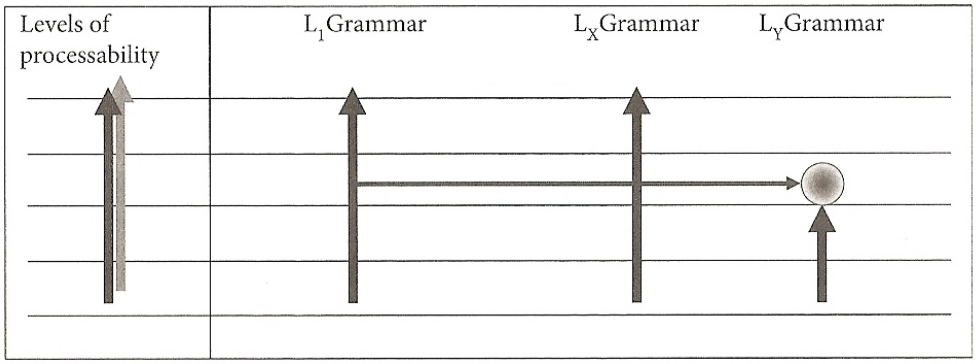


Figure 10: The developmentally moderated transfer hypothesis (DMTH) (taken from Pienemann & Keßler, 2011, p. 76)

In light of this, Pienemann and Keßler (2011) identify two important aspects of the DMTH:

1. The L1 and L2 contain the same grammatical structure, but the structure appears later in L2 development. The DMTH posits that since the structure requires a higher stage mapping process or feature unification in L2, learners cannot transfer it to L2 at the initial state. However, the grammatical structure in L2 will be acquired efficiently once L2 learners can process the structure.
2. The L1 and L2 contain a different grammatical structure, but the different structure appears early in L2 development. The DMTH postulates that since the structure requires a lower stage mapping process or feature unification in L2, they produce the structures early in their L2 development.

As a result, the DMTH defines a specific partial role of transfer depending on the developmental readiness of L2 learners and the complexity of mapping procedures, rather than merely based on similarities and differences between L1 and L2 at the surface level.

2.5 Japanese and the processability hierarchy

Since the level of grammatical information transfer of a given grammatical structure varies across languages, as discussed earlier, the PH needs to be applied to languages with a structural analysis based on the principles of PT discussed above (e.g., feature unification, lexical mapping, hypothesis space, etc.). To develop a Japanese-specific PH, LFG-based structural analyses are essential. In doing so, fundamental features of Japanese grammar first need to be described.

2.5.1 Brief description of Japanese grammar

Fundamental features of Japanese are as follows: SOV order, a head-final structure (all kinds of modifiers precede the head), postpositional case particles that indicate grammatical and semantic relations of arguments (e.g., nominative (ga: NOM), dative (ni: DAT), accusative (o: ACC), genitive (no: GEN), and topic marker (wa: TOP) (e.g., Kuno, 1973; Shibatani, 1990; Tsujimura, 2007).

Japanese is typologically considered a NOM-ACC language. Therefore, generally, NOM marks both a transitive and intransitive subject while ACC marks a transitive object (Shibatani, 1990):

e.g.,

1) *Takashi-ga* *piano-o* *hiita*
   Takashi-NOM piano-ACC play-PAST
   'Takashi played the piano.'

Due to the use of postpositional case particles to indicate grammatical and semantic relations, Japanese allows a relatively flexible word order. However, the verb must be placed at the end of the sentence (Shibatani, 1990). Sentence 2) possesses the same meaning as sentence 1) (i.e., these nominal constituents are scrambled).

e.g.,

2) *Piano-o* *Takashi-ga* *hiita*
   Piano-ACC Takashi-NOM play-PAST
   'Takashi played the piano.'

Li and Thompson (Li, 1976; Thompson, 1978 as cited in Kawaguchi, 2010) introduced the typological distinction between topic prominence and subject prominence. Accordingly, languages are classified into four groups: subject prominent, topic prominent, both subject and

topic prominent, and neither subject nor topic prominent. Japanese is considered to belong to both the subject and topic-prominent groups.

Topic construction is frequently used in Japanese. The postpositional case particle 'wa' (TOP) is used when indicating the grammatical relation of topic. The topic participle can be added after NP with another postpositional particle (Kuno, 1973; Kawaguchi, 2010):

e.g.,

3) *Suzuki-san- ni- wa moo tegami-o dashita*
Suzuki-Mr-DAT-TOP already letter-ACC send-PAST
'To Mr, Suzuki, (I) have already sent a letter.'

However, NOM: 'ga' and ACC: 'o' particles replace the topic particle when SUBJ or OBJ is a topic of the sentence (Kuno, 1973; Kawaguchi, 2010).

When the topic is the same as the subject of the sentence, the topic comment and subject comment are identical (Kuno, 1973):

e.g.,

TOP_{SUBJ} O V

4) *Suzuki-san-wa kono tegami-o kaita*
Suzuki-Mr-TOP this letter-ACC write-PAST
'As for Mr. Suzuki, (he) wrote this letter; Mr. Suzuki wrote this letter'

S O V

5) *Suzuki-san-ga kono tegami-o kaita*
Suzuki-Mr-NOM this letter-ACC write-PAST
'Mr. Suzuki wrote this letter.'

Ø O V

6) *Kono tegami-o kaita*
This letter-ACC write-PAST
'(he) wrote this letter'

According to Kuno (1973), the central difference between these two types of sentences, 4) and 5), lies in the information structure. The $TOP_{SUBJ}OV$ structure is realized as a TOP-comment sentence, namely that TOP_{SUBJ} is previously established. Therefore, TOP_{SUBJ} 'wa' has the notion of old/given information. In addition, the predicate is salient in that type of sentence. However, the SUBJ-predicate structure is realized as an 'event-reporting' sentence, and the SUBJ 'ga' has the notion of new information. In this type of sentence, both the subject and predicate are relatively equally salient. Therefore, omission of SUBJ is only possible in $TOP_{SUBJ}OV$, as seen in 6) (Lambrecht, 1994). Furthermore, both 4) and 6) would be an answer to a question such as, *Suzuki-san wa nani o sita ka* 'What did Mr.Suzuki do?' However, 5) would be an answer to the following question, *doo shimashita ka* 'What happened?' (Kawaguchi, 2010).

Further, representative uses of 'wa' and 'ga' particles and their meanings are classified in two types of 'wa' and three kinds of 'ga' (Kuno, 1973): [thematic: 'wa'], [contrastive: 'wa'], [descriptive: 'ga'], [exhaustive-listing: 'ga'], and [objective: 'ga']. The following sentences exemplify each category of 'wa' and 'ga' uses.

- Thematic '*wa'*: "Speaking of..., talking about..."

  e.g.,

  7) *Tom-wa gakusei desu.*
     Tom-TOP student is
     'Speaking of Tom, (he) is a student.'

- Contrastive '*wa'*: "X..., but..., as for *X*..."

  e.g.,

  8) *Yuki-wa hutte imasu ga...*
     snow-TOP falling is but
     "It is snowing, but…"

- Descriptive '*ga'* (neutral description of actions or temporary states):

  e.g.,

  9) *Yuki ga hutte intasu.*
     snow-NOM falling is
     'It is snowing'

- Exhaustive-listing '*ga'*: "X (and only X) ..." , "It is X that ..."

  e.g.,

  10) *John ga gakusei desu.*
      John-NOM student is
      '(Of all the people under the discussion) John (only John) is a student.'
      'It is John who is a student.' (Kuno, 1973, p. 38)

- Objective: '*ga'* (object of stative transitive verb):

  e.g.,

  11) *Taroo wa eigo ga suki desu.*
      Taro-TOP English-NOM like
      'Taro likes English'

[Thematic '*wa'*] is used to mark NP as theme/TOP. The 'wa' appears with NP that is either anaphoric, generic, or otherwise assumed to be known to the listener or reader (i.e., old/given information). The use of 'wa' is often considered to be parallel to the use of the definite article 'the' in English. [Contrastive 'wa'] is utilized to mark NP as TOP to contrast the NP with other NPs. For the uses of 'ga', [Descriptive 'ga'] is used to mark NP as SUBJ, and the 'ga' shows a function of neutral description of actions or temporary states. NP/SUBJ marked with 'ga' most likely represents information newly introduced to the discourse. This means as opposed to [Thematic 'wa'], the use of 'ga' is often considered to be parallel to the use of the

indefinite article ‘a’ in English. [Exhaustive-listing: ‘ga’] is also used to mark NP as SUBJ, but the ‘ga’ shows the meaning of “exhaustive listing”. For instance, in Sentence j), *John-ga gakusei desu*, ‘*John’* is marked with ‘ga’ as the one and only student among those people under discussion (Kuno, 1973). In addition, the use of the ‘ga’ also represents new information in the discourse. [Objective: ‘ga’] is used to mark a NP as OBJ in a sentence with a stative transitive verb.

The distinctions among [thematic ‘wa’], [Contrastive ‘wa’], [descriptive ‘ga’], and [exhaustive listing ‘ga’] are neutralized in a subordinate/relative clause, and all of them are realized as ‘ga’ (Martin, 1975). In other words, ‘wa’ NP/TOP is not allowed to appear in relative clauses regardless of these meaning distinctions, and ‘ga’ NP/SUBJ must be used no matter if the NP is old/given or new information. The ‘wa’ and ‘ga’ distinction is discussed again in the next chapter, the hypotheses section, and the Japanese relative clause is discussed later in this section.

Any emphatic constituent NP in a sentence can be ‘topicalized’ using ‘wa’ (e.g., NP object). The ‘wa’ usually occupies the initial position of the sentence (Kuno, 1973). It is also possible to topicalize a noncore argument, such as adjunct and oblique locatives as in 12) and 13).

e.g.,

TOP_{OBJ} O V

12) *Kono tegami-wa suzuki-san -ga kaita*
This letter-TOP suzuki-Mr-NOM write-PAST
‘This letter, Mr suzuki wrote’

(Kawaguchi, 2010, p. 95)

e.g.,

$TOP_{adjunct}$ S O V

13) *Kinoo-wa* *Tanaka-san-ga* *kono tegami-o* *kaita*
Yesterday-TOP Tanaka-Mr-NOM this letter-ACC write-PAST
'Yesterday, Mr.Tanaka wrote this letter'

(Kawaguchi, 2010, p. 96)

Since Japanese has a head-final structure, as described earlier, a relative clause precedes its head noun. As well, Japanese does not require a relative pronoun to connect a relative clause and its head noun (Shibatani, 1990; Tsujimura, 2007).

e.g.,

14) *Takashi-ga* *[Hahaoya-ga* *tukutta]* ***sushi-o*** *tabeta*
Takashi-NOM mother-NOM make-PAST Sushi-ACC eat-PAST
'Takashi ate the sushi which (his) mother made'

In addition to the absence of relative pronouns, Japanese relative clauses have a phenomenon termed 'Ga/No conversion' by Harada (1971) (e.g., Shibatani, 1990; Miyagawa, 1993; Tsujimura, 2007). When relative clauses consist of an NOM 'ga', the 'ga' is replaceable with GEN 'no' without a difference in meaning (e.g., Tsujimura, 2007).

e.g.,

15) *Takashi-ga* *[Hanako-**ga*** *kaita]* *e-o* *hometa*
Takashi-NOM Hanako-NOM paint-PAST painting-ACC praise-PAST
'Takashi praised the painting that Hanako painted'

16) *Takashi-ga* *[Hanako-**no*** *kaita]* *e-o* *hometa*
Takashi-NOM Hanako-GEN paint-PAST painting-ACC praise-PAST
'Takashi praised the painting that Hanako painted'

Ellipsis is another important aspect of Japanese grammar. Since ellipsis is extensively used to avoid lexical redundancy and increase discourse cohesion, any constituents (e.g., noun phrases, postpositional nominal particles, and verbs) could be omitted, as long as they are recoverable from the context (e.g., Hata, 1980; Hinds, 1982). Ellipsis in Japanese is normally used like pronouns in English. Therefore, it is rare to utilize pronoun other than a first person singular. Though elliptic elements are generally realized by inflectional morphology, especially in the agreement system, in pro-drop languages, such as Spanish (Taraldsen, 1978), Japanese does not have grammatical gender or morphological plural/singular distinctions (Kawaguchi, 2010). In addition, no agreement phenomena between subject and verb, as well as the numeral and the noun, occurs either (Kawaguchi, 2010). Thus, elliptic elements are not recoverable from morphology, and therefore are considered a discourse feature (e.g., Kuroda, 1965 as cited in Kawaguchi, 2010; Hata, 1980).

For morphology, as discussed, Japanese does not have grammatical gender or number distinctions, and no agreement occurs between subject and verb, or numeral and noun (Tsujimura, 2007). Japanese is considered an agglutinating language; therefore, a verb consists of a stem plus strings of affixed morphemes. When more than two suffixes are sequenced, the relative order of these morphemes is generally fixed. A typical verbal morpheme sequence in Japanese is as follows (Shibatani, 1990):

17) Vstem-causative-passive-aspect-desiderative-negative-tense

In light of the grammatical structures discussed above, L2 researchers from a PT perspective have examined Japanese grammar, drawing on LFG-based analyses, to integrate them into the PH. The hypothesized Japanese PH then has been established and tested in empirical studies. Table 6, below, illustrates the hypothesized Japanese PH (Kawaguchi, 2009,

2010). The following section discusses the literature which has applied PT to L2 Japanese acquisition.

Table 6. Processing hierarchy of Japanese grammatical structures (based on Kawaguchi, 2009, 2010)

	Processing procedures	Exchange of grammatical information	Japanese L2 morphsyntax
Stage 5	Subordinate clause procedure	Main and sub-clauses distinction	Particle 'wa'/'ga' distinction in main and sub-clauses
Stage 4	Sentence procedure	Inter phrasal information	OBJ topicalization (i.e. TOP_{OBJ} SV) Morpholexical operations (PASS, CAUSE, BENE)
Stage 3	Phrasal procedure	Phrasal information	TOP+SOV V-teV
Stage 2	Categorical procedure	None	Canonical order SOV TOP_{SUBJ} OV (i.e. Nominal marking of semantic roles, V-Final) TOP_{OBJ} OV
Stage 1	Word or lemma access	None	Single constituents Formulaic expressions

2.5.2 Review of literature that has applied PT to L2 Japanese

As discussed earlier, PT attempts to account for how knowledge of morphosyntax develops over time, and predicts learners' developmental sequence of grammatical structures regardless of language using a language-specific PH. PT has been applied and tested cross-linguistically with many languages, including Arabic, Chinese, German, Italian, Swedish, Turkish, Spanish, and Japanese (e.g., Di Biase & Kawaguchi, 2002; Mansouri, 2005; Zhang, 2005).

A number of studies have applied PT to L2 Japanese acquisition. Research by Doi and Yoshioka (1990) has applied the Pienemann-Johnston Model (i.e., the predictive framework

discussed earlier) to account for an acquisition order of case particles ‘wa’, ‘o’ and ‘ga’ based on cross-sectional assessment of accuracy. Doi and Yoshioka (1990) carried out an interview with 24 learners of Japanese as a L2 at three different proficiency levels. They hypothesized that these learners acquire TOP ‘wa’ at Stage 3, and NOM ‘ga’ and ACC ‘o’ at Stage 5. Since topicalization of NP requires no grammatical knowledge of the lexical category or internal structure of the clause, L2 learners would acquire TOP ‘wa’ at Stage 3. However, marking NOM ‘ga’ and ACC ‘o’ requires understanding of grammatical relations between NPs and their predicates. Therefore, NOM ‘ga’ and ACC ‘o’ would be acquired at Stage 5. The results supported the hypothesis that ‘wa’ would be acquired before ‘o’ and ‘ga’. In addition, these researchers found that the L2 learners acquired ‘o’ before ‘ga’, and ‘ga/OBJ’ is acquired before ‘ga/SUBJ’. Despite their attempt to contribute to L2 Japanese research from a PT perspective, Pienemann (1998b) criticized this study due to a lack of sufficient grammatical analysis, poorly classified grammatical structures (especially, TOP ‘wa’), and the use of accuracy as an acquisition criterion.

Another early piece of research in the PT paradigm by Hunter (1997) consisted of three-year longitudinal research, using Pienemann’s theory (the predictive framework) (Pienemann, 1994; Pienemann et al., 1998 as cited in Kawaguchi, 2010), to describe five university students’ developmental sequence in L2 Japanese acquisition. She elaborated developmental phases based on her distributional analysis:

Phase 1: Basic sentence structures, basic categories;
Phase 2: Extension of noun, verb phrases and sentence;
Phase 3: Change of some categorical features, and thereby establishment of new sub-categories (which are filled with new lexical items);
Phase 4: sentence level of clauses and syntactic category of lexical items can be changed (depending on the syntactic environment and intended meaning).

(Huter, 1997, p. 11)

She concluded her research by saying that, although the results followed Pienemann's hypothesized stages, "the rules of information processing procedure were not applicable to noun phrases and their development [because] noun phrase development is dictated by the characteristics inherent to the system of Japanese noun phrase" (Huter, 1997, p. 39). However, Kawaguchi (2010) criticized this study, pointing to its insufficient theoretical framework to support the argument, and the unclear grammatical descriptions for the stages.

Research by Kawaguchi (1998) looked at the developmental sequence of syntactic structures and referential choice (i.e., full noun and nominal ellipsis) in L2 Japanese discourse, drawing on seven English-speaking university students learning Japanese at beginner, intermediate, and advanced levels. The speech production of these learners, elicited by controlled tasks, was analyzed for the choice of referential form in these sentences. The sentence structures in the speech were then examined based on L2 Japanese stages discerned from the Pienemann's theory (Pienemann, 1994 Pienemann et al., 1998 as cited in Kawaguchi, 2010). These results suggested that cognitive factors, such as potential ambiguity and attention shift, affected referential choice. In addition, the acquisition sequence of Japanese syntax coincides with these stages of L2 Japanese identified by a three-year longitudinal study conducted by Huter (1997).

Subsequently, Pienemann (1998b) attempted to predict, using data from studies by Huter (1997, 1998) and Kawaguchi (1996), an acquisition sequence of morphology in L2 Japanese acquisition. Accordingly, three sequential stages in the acquisition of verbal morphology appeared: (1) no affix, (2) lexical affix, and (3) phrasal affixes (Pienemann, 1998b). No affixation occurs on verbs at the first stage because L2 learners do not realize any categorical information in the lexicon. Affixation then occurs on verbs at the 'lexical affix' stage, but this is

still a lexical process. “Therefore, the only processing requirement for the insertion of most of the verbal morphemes such as causative, passive, aspect, desiderative, negation and tense, is that the formal lexical class ‘verb’ is so marked in the lexicon” (Pienemann, 1998b, p. 210). Inter-phrasal information exchange (e.g., such as subject-verb agreement in English) occurs at the ‘phrasal affixes’ stage, but, as discussed earlier, agreement marking for person or number on verbs does not occur in Japanese. However, inter-phrasal processing is important for verb morphology in Japanese when a compound verb appears, such as the ‘V-*te* V’ structure. This structure contains a verb marked with ‘-*te*’ in the preceding position (i.e., the first verb) and another verb in the following position in the end of the sentence (i.e., the second verb), as seen sentence r) below.

e.g.,

18) *Taroo wa* *sono ringo o* *tabe-te* *imasu.*
Taro-TOP that apple-OBJ eat-COMP ing-ASPECT
‘Taro is eating that apple’

The preceding (first) verb may contain various inflections, such as causative and passive, but it is always marked with ‘-*te*’ at the end of the morphology, resulting that lexical information needs to be exchanged with a subsequent verb. The sequence of the three stages of structures is in line with these three stages of processing procedure: no affix < lexical affix < phrasal affixes. The hypothesized sequence was supported by the data from studies by Huter (1997, 1998) and Kawaguchi (1996).

Kawaguchi (2000) was the first researcher who formally applied and tested PT in L2 Japanese, based on Pienemann’s (1998b) research. Kawaguchi’s research attempted to establish stages of L2 Japanese development, especially verbal morphology. She hypothesized that a basic form of verbs (i.e., present-tense polite form) would be acquired as unanalyzed formulae at Stage

1. Then, verbal ending alternations, such as past or negative forms, of the verbal stem would become available for recognition at Stage 2. At Stage 3, various combinations of verbal stem-affix(es) would become available because L2 learners acquire information exchange skills within verb phrases. Then, production of adverbial clauses would be available at Stage 4 (interphase morphology). Although Kawaguchi's hypothesis was supported by her empirical study, grammatical descriptions for each stage were vague, and some parts of these explanations were incompatible with LFG (Kawaguchi, 2000).

A study by Di Biase and Kawaguchi (2002) has tested the typological plausibility of PT. This study significantly advanced L2 Japanese research from a PT perspective. The researchers investigated an acquisition sequence of morphosyntax in L2 Japanese and L2 Italian (only a part of the research relevant to Japanese is discussed here). They conducted a three-year longitudinal study of one participant and a cross-sectional study of nine participants. The participants were all native speakers of English learning Japanese as a L2 at an Australian university. For the longitudinal study, the researchers conducted interviews consisting of free conversation and picture-based tasks every one to two months, totaling 13 times, for distributional analyses of verbal morphosyntax. The cross-sectional study utilized the same interview. The researchers employed the same acquisition criteria for both the longitudinal and cross-sectional studies as Pienemann's research (1998b), and hypothesized developmental stages of the acquisition sequence of morphosyntactic constructions, including passive, causative and benefactive structures, based on Pienemann's (1998b) hierarchy. Drawing on principles of LFG, they placed verbal inflection at Stage 2 because it is considered a lexical operation. Although Japanese verbal morphology involves agglutination of various suffixes (e.g., tense, politeness, negation, etc.,) to

add semantic features, no information exchange between these morphemes occurs. Therefore, they posited that only a lexical operation is required for the acquisition of verbal inflection.

The researchers placed the 'V-te V' structure at Stage 3 because it is a combination of two verbs with the first one marked with COMP (i.e., complementaizer) '-te'. The information exchange between these two verbs, which requires the phrasal procedure, is called "combinatoric TYPE" (Sells, 1995, 1996). According to Sells (1995), the verb stem and the right-most suffix possess essential linguistic information because the former verb determines the category and the latter verb is realized as the combinatoric TYPE, as seen in Figure 11.

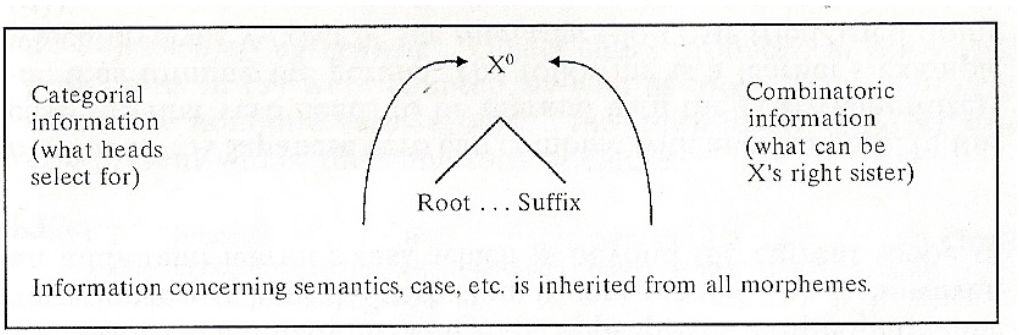


Figure 11: Information flow in inflectional structures (taken from Sells, 1995 as cited in Di Biase & Kawaguchi, 2002, p.293).
Note:X^0 = word

Japanese suffixes can be classified into these following TYPE values ('a sister' means a node comes from the same mother node in a tree structure) (Sells, 1995 as cited in Di Biase & Kawaguchi, 2002):

- TYPE: V-sis = the verb to which the suffix is attached has V as a sister;
- TYPE: N-sis = the verb to which the suffix is attached has N as a sister;
- TYPE: ROOT = the verb to which the suffix is attached has no sister, i.e., the verb should appear at the end of a sentence.

On this basis, Di Biase and Kawaguchi (2002) claim that, when the TYPE of the first V is 'V-sis' (that is always the COMP '-te' in Japanese), the element following the V should be V. Therefore, L2 learners must exchange the information between the two Vs to form a well-formed VP; in other words, they need the phrasal processing procedure for the 'V-te V' structure. Figure 12 exemplifies the phrasal processing procedure using *si-te mi-masi-ta* 'try doing (it)'

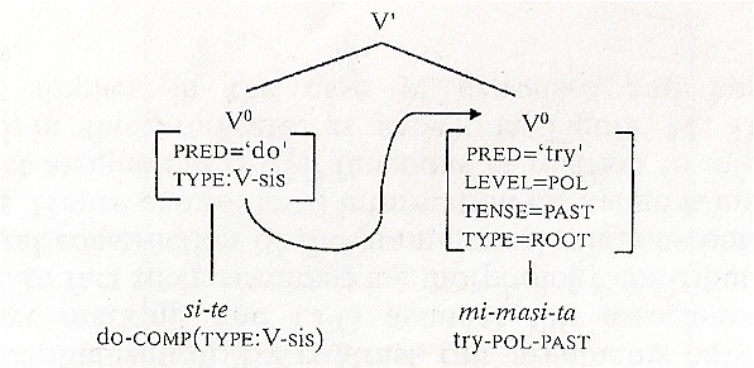


Figure 12: The structure of the verb si-te mi-masi-ta (taken from Di Biase & Kawaguchi, 2002, p.294)

Di Biase and Kawaguchi (2002) placed passive, causative, benefactive constructions in Stage 4 because the constructions require L2 learners to process linguistic information 'inter-phrasally'. According to Bresnan (2001), English passivisation is not simply verb inflection, but has accompanying syntactic effects. On this basis, the researchers have hypothesized that a parallel situation would apply to Japanese. Although the affixation of a passive (causative and beneficative) construction to a verb stem is a lexical operation, it also has syntactic effects, including case alteration. For instance, L2 learners need to exchange information from different sources (i.e., from V and NPs,) in a passive sentence, which requires an inter-phrasal process, to correctly indicate grammatical and semantic relationships amongst NPs, such as NP as OBLag (i.e., oblique agent) marked with a case particle 'ni' in a passive construction. Figure 13

exemplifies the inter-phrasal processing procedure using the passive sentence *sakana-ga neko-ni taberareta* 'the fish was eaten by a cat'

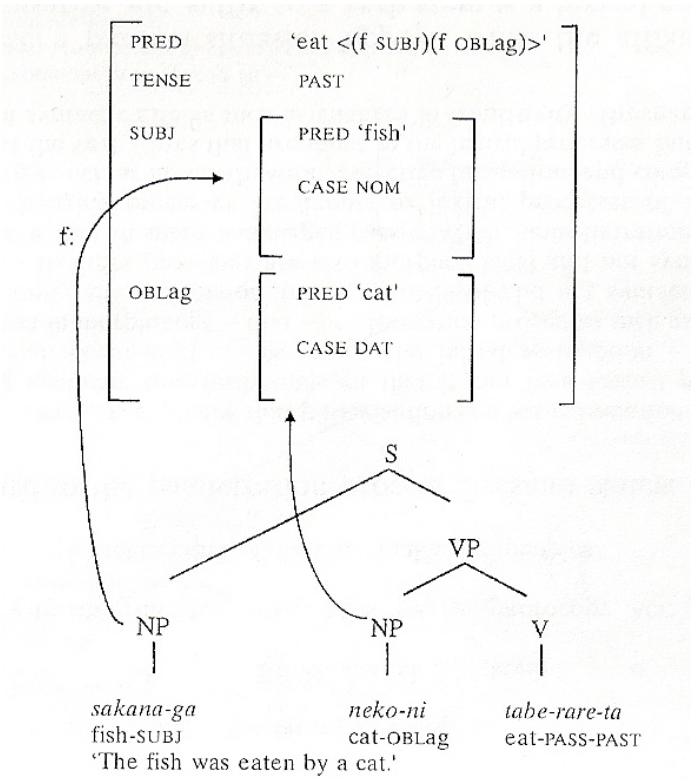


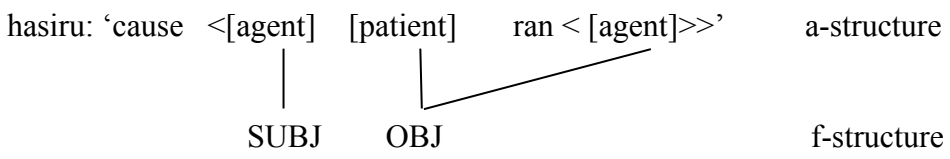
Figure 13: F-structure and c-structure correspondence for the passive sentence 'sakana-ga neko-ni tabe-rare-ta' (taken from Di Biase & Kawaguchi, 2002, p.296)

They claim that the acquisition of passive construction would be considered a lexical processing procedure, Stage 2, if L2 learners produce a passive verb without case particles. If L2 learners produce a passive verb with only NP/SUBJ '*ga*', it would not provide sufficient evidence for the acquisition of the S-procedure either because it does not show understanding of grammatical and semantic relationships between these NPs. Therefore, L2 learners would be regarded as having acquired the S-procedure only when a passive form is produced with the NP/OBLagent marked with the case particle 'ni'. In other words, the presence of the OBLagent

‘ni’ in a passive sentence indicates that mapping between grammatical and semantic functions can be successfully done by using appropriate morphological case marking with the particle ‘ni’.

These principles and criteria apply to the causative and benefactive constructions as well (Di Biase & Kawaguchi, 2002, Kawaguchi, 2007, 2010). Causative constructions involve non-liner mapping due to the fusion of thematic roles in the event and sub-event in the argument structure (Kawaguchi, 2007). Sentence (iv), below, shows the fusion of thematic roles in the event and sub-event in the argument structure.

(iv). *Tamiko-ga* *musuko-o/ni* *hasir-ase-ta*
Tamiko-NOM son-ACC/DAT run-CAUSE-PAST
‘Tamiko made (her) son ran’.



(Adapted from Kawaguchi, 2010, p. 120)

Research showed that Japanese (coercive) causatives involve causer-controlled sub-events, in which the logical subject of the embedded clause is unified to the OBJ/patient of the matrix clause (e.g., Alsina, 1992; Matsumoto, 1996 as cited in Kawaguchi, 2010). Alsina (1996) assumed that “the causative verb and the base verb undergo predicate composition yielding one, single, complex a-structure” (p. 186). This means that the Japanese causative involves an embedded sub-event at the a-structure level, but this is realized as a single clause in the f-structure, as seen sentence (iv). The two thematic roles, the agent and the patient are unified into one in f-structure. This indicates that the causative verb and the base verb behave like one single predicate, which clearly requires non-default mapping process. Therefore, causative construction is placed at Stage 4.

Kawaguchi (2007) provided detailed descriptions of benefactive constructions, showing that this construction belongs to Stage 4. The auxiliary verbs of giving and receiving are referred to as 'benefactives' (Backhouse, 1993). The main verb precedes the benefactive auxiliary that contributes the benefactive role in the constructions. Japanese benefactive predicates are as follows (Backhouse, 1993 as cited in Kawaguchi, 2007): (a) V-te ageru; '(I/we, etc.) do (something for someone)', (b) V-te kureru '(someone) does (something as a favor to 'me/us')', and (c) V-te morau '(I/we, etc.) receive the favor of (someone doing something for 'me/us, etc.').

e.g., Give-schema (a)

19) *Mariko-ga* *kodomo-ni* *hon-o* *yon-de* *age-ta.*
Mariko-NOM child-DAT book-ACC read-XCOMP give-PAST
'Mariko read a book to the child'

(Kawaguchi, 2007, p. 53)

e.g., Give-schema (b)

20) *Tomodachi-ga* *musume-ni* *seetaa-o* *an-de* *kure-ta.*
Friend-NOM my daughter-DAT sweater-ACC knit-XCOMP give-PAST
'My friend knitted a sweater for my daughter'

(Kawaguchi, 2007, p. 53)

e.g., Receive-schema

21) *Kodomo-ga* *Mariko-ni* *hon-o* *yon-de* *morat-ta.*
child-NOM Mariko-DAT book-ACC read-XCOMP receive-PAST
'The child received the favor of Mariko reading a book'

(Kawaguchi, 2007, p. 53)

Research showed that Japanese benefactive constructions are functionally 'biclausal' (Ishikawa 1985 as cited in Kawaguchi, 2010; Matsumoto, 1996; Shibatani, 1994). On this basis, Kawaguchi (2007) presented the lexical entries and f-structure of the sentences above.

lexical entry of *ageru* "give" and f-structure
lexical entry ageru (give): V
(↑PRED)='*ageru* (give) <benefactor, beneficiary, beneficial event>
(SUBJ) (OBJgoal) (XCOMP)

f-structure

PRED	'give < SUBJ, OBJgoal, XCOMP>'
Subject	[PRED 'Mariko']
OBJgoal	[PRED 'kocomo (child)']
XCOMP	PRED 'read <SUBJ, OBJ>'
	Subject
	OBJ [PRED 'book']

Figure 14: Lexical entry and f-structure of sentence s) (taken from Kawaguchi, 2007, p. 54)

lexical entry of *kureru* "give" and f-structure
kureru (give): V
(↑PRED)='*kureru* (give) <benefactor, beneficiary, beneficial event>
(SUBJ) (OBJgoal) (XCOMP)
I/one of us

f-structure

PRED	'give < SUBJ, OBJgoal, XCOMP>'
Subject	[PRED 'tomodachi (friend)']
OBJgoal	[PRED 'musume (my daughter)']
XCOMP	PRED 'knit <SUBJ, OBJ>'
	Subject
	OBJ [PRED 'book']

Figure 15: Lexical entry and f-structure of sentence t) (taken from Kawaguchi, 2007, p. 54)

lexical entry of *morau* "receive" and f-structure of (12 c.)

receive: V

(↑PRED)='*morau* <beneficiary, benefactor, beneficial event>

(SUBJ) (OBJsource) (XCOMP)

f-structure

```
[ PRED      'receive < SUBJ, OBJsrc, XCOMP>'
  Subject   [PRED        'kodomo (child)']
  OBJsrc    [PRED        'Mariko']
  XCOMP     [ PRED         'read <SUBJ, OBJ>'
              Subject
              OBJ  [PRED   'book']
]
```

Figure 16: Lexical entry and f-structure of sentence u) (taken from Kawaguchi, 2007, p. 55)

All benefactive predicates take SUBJ, OBJ and XCOMP as arguments. XCOMP is a clausal complement without its own subject, whose reference is determined by an external subject (e.g., Bresnan, 2001). The XCOMP's SUBJ is linked to the same function, SUBJ, in the matrix clause in the two give-schema benefactives. Though these two benefactives take the same argument structure, the lexical entry of the auxiliary 'kureru' adds one constraint, the beneficiary is either 'I' or the person from the 'in group' (family members are considered to be an 'in-group') (Kawaguchi, 2007). The XCOMP's SUBJ is linked to the OBJ function in the matrix clause in the receive-schema benefactive. In light of the lexical entries and f-structure representations above, although all three benefactives show SUBJ-OBJθ-OBJ-V liner order (Japanese canonical order), they are not canonically mapped. This is because they are involved with a complex predicate in which the f-structure of SUBJ in XCOP is identified with the value of an argument function in the higher matrix, as seen the figures above (Kawaguchi, 2007). Therefore, benefactive constructions are placed at Stage 4 in the Japanese PH. Research by

Kawaguchi (2005) added 'OBJ topicalization construction' to Stage 4. LFG-based analysis of the construction is discussed in the next chapter.

Research (Di Biase & Kawaguchi, 2002; Kawaguchi, 2005, 2007, 2010) supported all the hypothesized morphosyntactic constructions, including passive, causative, and benefactive structures, and showed that L2 learners followed the fixed developmental sequence regardless of language: word access > category procedure > phrasal procedure > S-procedure, as PT predicts.

2.6 Research questions

These studies, discussed above, have been replicated and tested to increase the validity of PT, as well as refining the Japanese-specific PH. However, as Kawaguchi (e.g., 2007, 2009) has addressed, few studies, if any, has focused on advanced learners of Japanese as a L2, and tested the highest stage of PH, Stage 5. In addition, although Kawaguchi (2007, 2009) has hypothesized the 'wa' and 'ga' case particle distinction in subordinate clauses as a morphosyntactic construction that belongs to Stage 5 in the Japanese PH, little research, if any, addresses formal descriptions of the morphosyntactic construction, drawing on LFG-based analysis, to formally assign the construction to Stage 5. On this basis, the following research questions are at the heart of the present study:

(1) What are formal descriptions of the morphosyntactic construction that belongs to Stage 5, 'wa' and 'ga' particle distinction in matrix and subordinate clauses, in light of LFG-based analysis?

(2) In light of the LFG-based analysis, does the morphosyntactic construction actually belong to Stage 5 as Kawaguchi (2007, 2009) hypothesizes?

(3) If so, do L2 learners sequentially follow the hypothesized Japanese PH including Stage 5, as PT predicts?

In addition to validating whether the morphosyntactic construction belongs to Stage 5 in the Japanese-specific PH, by answering these questions this study will offer an important perspective on understanding a universal developmental sequence of L2 acquisition, and how (L2) language acquisition may be linked to a universal underlying representation of language.

2.7 Summary

For the sake of building the conceptual framework for the present study, this chapter provided a summarization of the historical overview of L2 acquisition sequence research, including morpheme studies (e.g., Brown, 1973; Dulay & Burt, 1973, 1974), the multidimensional model (e.g., Clahsen, Meisel, & Pienemann, 1983 as cited in Cook, 1993), and the predictive framework (Pienemann's theory) (e.g., Pienemann & Johnston, 1985). This illustrated how PT has developed based on the previous approaches and models. This chapter also presented the theoretical framework of processability theory (PT) and its important components, Levelt's (1989) speech model and lexical functional grammar (LFG) (e.g., Bresnsan, 2001). After having discussed the fundamentals of Japanese grammar, this chapter synthesized the literature that has applied PT to L2 Japanese acquisition to contextualize the research questions that the present paper has proposed.

To answer the research questions contextualized by this chapter, the next chapter hypothesizes formal descriptions of 'wa' and 'ga' particle distinction in matrix and subordinate clauses drawing on LFG-based analysis. This determines whether the hypothesized morphosyntactic construction by Kawaguchi (2007, 2009) belongs to Stage 5 according to the theoretical principles of PH.

Chapter 3. Hypotheses

3.1 Introduction

The first step to answering the research questions was to contextualize the present study, (1) What are formal descriptions of the morphosyntactic construction that belongs to Stage 5, 'wa' and 'ga' distinction in matrix and subordinate clauses, in light of LFG-based analysis? (2) In light of the LFG-based analysis, does the construction actually belong to Stage 5 as Kawaguchi (e.g., 2009) hypothesizes? (3) If so, do L2 learners sequentially follow the hypothesized Japanese PH including the construction, as PT predicts?. Therefore, the previous chapter provided a summarization of the historical overview of L2 acquisition sequence research to illustrate how the processability theory (PT) has been established. The previous chapter then presented the theoretical framework and the principles of PT, which was followed by the descriptions of fundamental Japanese grammar to discuss the synthesis of the literature that has applied PT to L2 Japanese acquisition. The literature review was followed by the conceptual framework, which framed the research questions.

This chapter hypothesizes formal descriptions of the morphosyntactic construction, 'wa' and 'ga' case particle distinction in matrix and subordinate clauses, in light of LFG-based analysis. This determines whether the hypothesized construction belongs to Stage 5 (S'-procedure), based on the theoretical principles of PH. This is crucial to empirically test one of these research questions: whether L2 learners sequentially follow the hypothesized Japanese PH including the hypothesized construction, as PT predicts.

This chapter begins by reviewing the S'-procedure in PH and Japanese grammar of the 'wa' and 'ga' case particle distinction in matrix and subordinate (embedded) clauses. In light of this, this chapter then moves to presenting LFG-based formal descriptions of 'wa' and 'ga' case particle distinction in subordinate (embedded) clauses to determine whether the hypothesized construction belongs to Stage 5.

3.2 Review of 'wa' and 'ga' distinction in embedded/relative clause in Japanese

As discussed earlier, the fundimental difference between a TOP-comment sentence with 'wa' and a SUBJ-comment sentence with 'ga' (e.g., sentences d) and e) in the previous chapter) lies in their information structure. TOP/SUBJ structure is realized as a TOP-comment sentence, namely that TOP_{SUBJ} is previously established. Therefore, TOP/SUBJ 'wa' has the notion of old/given information. However, a SUBJ-comment sentence is realized as an 'event-reporting' sentence, and SUBJ 'ga' has the notion of new information. (e.g., Kuno, 1973; Shibatani, 1990; Tsujimura, 2007). Kuno (1973) presented further classifications of 'wa' and 'ga' in terms of representative uses of them and their meanings: [thematic: 'wa'], [contrastive: 'wa'], [descriptive: 'ga'], [exhaustive-listing: 'ga'], and [objective: 'ga']. Moreover, these distinctions are neutralized in relative clauses, and all of them are realized as 'ga' (Martin, 1975). This indicates that 'wa' NP/TOP is not allowed in relative clauses regardless of the meaning distinctions; 'ga' NP/SUBJ has to be utilized no matter if it is new or old/given information.

As discussed, a Japanese relative clause precedes its head noun, and it does not require a relative pronoun to connect a relative clause and its head noun (Shibatani, 1990; Tsujimura, 2007).

e.g.,

22) *Takashi-ga* *[Hahaoya-ga* *tukutta]* ***sushi-o*** *tabeta*
Takashi-NOM mother-NOM make-PAST Sushi-ACC eat-PAST
'Takashi ate the sushi that (his) mother made'

Japanese relative clauses have a phenomenon called 'Ga/No conversion' (Harada, 1971). When relative clauses possess NP marked with NOM 'ga', the 'ga' is replaceable with GEN 'no' without any difference in meaning (Tsujimura, 2007).

e.g.,

23) *Takashi-ga* *[Hanako-**ga*** *kaita]* *e-o* *hometa*
Takashi-NOM Hanako-NOM paint-PAST painting-ACC praise-PAST
'Takashi praised the painting that Hanako painted'

24) *Takashi-ga* *[Hanako-**no*** *kaita]* *e-o* *hometa*
Takashi-NOM Hanako-GEN draw-PAST painting-ACC praise-PAST
'Takashi praised the painting that Hanako painted'

These two phenomena: the prohibited appearance of 'wa' in relative clauses and the Ga/No conversion, would play an important role in observing the S'-procedure operation in the L2 Japanese PH.

3.3 Review of the S'-procedure in the processability hierarchy

As addressed in the previous chapter, the processability theory (PT) (Pienemann, 1998b, 2005) is designed to predict an acquisition sequence of grammatical structures using a processability hierarchy (PH), and PT views L2 acquisition as a gradual acquisition of the hierarchically organized processing procedures. PT can predict L2 learners' acquisition sequence of grammatical structures based on a language-specific PH because acquisition of processing

procedures at the lower levels in the hierarchy are prerequisites for the higher levels (Pienemann, 1998b).

In the S'-procedure, L2 learners distinguish between a matrix and subordinate clause. Pienemann (1998b, 2005) has accounted for the S'-procedure in L2 English and L2 German acquisition drawing on Kaplan and Bresnan's (1982) and Pinker's (1984) proposals. A syntactic operation in English, the so-called 'cancel inversion' (i.e., Subject-Auxiliary inversion does not occur in an indirect question sentence: '*I wonder* ***where he has gone***') requires the S'-procedure. He described the operation drawing on the feature of [ROOT = +/−] in f-structure and c-structure rules, phrase structure rules with annotated grammatical functions. [ROOT = +] shows that the clause is realized as a matrix clause, and [ROOT = −] means that the clause is realized as a subordinate/embedded clause. He claims that subordinate/embedded clauses can be distinguished from matrix clauses by having [ROOT = −] feature in their f-structure, which ensures no activation of such a syntactic operations as auxiliaries in a second position, the so-called 'ANX2nd' after preposed WH-words or adverb 'never'.

Of particular note to this S'-procedure description, Pienemann (1998b, 2005) 'only' claims that L2 learners distinguish between a matrix and subordinate clause for the S'-procedure. That is, he does not state that 'inter-clausal' grammatical information exchange occurs in the S'-procedure. Rather, he assumes that "[…] features of embedded clauses which distinguish those from matrix clauses are acquired after word order constraints in the matrix clause have been acquired (Pienemann, 1998a, p. 12)". In other words, he assumes that matrix and embedded clause distinction occurs after having acquired all of the processing skills of matrix clauses, without theoretical descriptions. However, a number of researchers, (e.g., Kawaguchi, 2007, 2009; Ågren, 2007), have assumed that grammatical information exchange occurs between

clauses in constructions belonging to the S'-procedure, based on the theoretical principles of PH. This indicates that it is necessary to hypothesize LFG-based theoretical descriptions of the S'-procedure, based on the principles of PT, to verify if the information exchange between clauses occurs in the procedure. Therefore, in the following section, I adapt Pienemann's treatments of the S'-procedure in English PH to hypothesize descriptions of the S'-procedure operation in Japanese PH. This employs LFG-based analysis, based on the principles of PT.

3.4 Hypotheses

In light of the review of Japanese grammar and S'-procedure operations in the processability hierarchy (PH), in this chapter I hypothesizes formal descriptions of the S'-procedure operation, in particular for the hypothesized Japanese S'-procedure construction, the so-called 'wa' and 'ga' distinction in embedded (relative) clauses, drawing on LFG-based analysis. I adjust Pienmann's treatment of the S'-procedure in English PH, based on the principles of PT, to formalize the Japanese S'-procedure operation. This could modify a theoretical description of the S'-procedure in English and German PH as well as of the S'-procedure in Japanese PH, possibly leading to refinement of the S'-procedure in the PH (non-language specific).

3.4.1 Formal descriptions of the S'-procedure operation: the 'wa' and 'ga' particle distinction in embedded clause construction

Distinction between a matrix and embedded clause is made by introducing the ROOT feature (Pienemann, 1998b, 2005). I use the term 'embedded clause' rather than 'subordinate clause' here to be consistent with Pinker's (1984) proposal. The [ROOT = −] feature in embedded clauses is certain not to activate such syntactic operations as auxiliaries in a second position, the so-called 'ANX2nd' after preposed wh-words or the adverb 'never' in English. In other words,

successful production of a structure with ‘cancel inversion’ indicates a L2 learner’s understanding of the ROOT features and discrimination between a matrix and an embedded clause.

In Japanese, as discussed, SUBJ has to be marked with ‘ga’ regardless of the information structure (new or old/given information) in embedded (relative) clauses. This may indicate whether L2 learners understand the ROOT features and discriminate between matrix and embedded clauses. Similar to the treatment taken for English, the [ROOT = −] feature needs to be appended to embedded (relative) clauses to activate the Japanese-specific rule, SUBJ has to be marked with ‘ga’ regardless of the information structure in embedded (relative) clauses. This is shown in the phrase structure rule (i) below, when NP consists of (S), the (S) must possess the [ROOT = −] feature. The (S) and the noun N (head) form the NP when the (S) is present (parentheses indicates optionality of the unit). That said, successful production of SUBJ ‘ga’ in embedded (relative) clauses in which the SUBJ has a notion of given information, indicates that the L2 learner understand the ROOT feature and discriminate between a matrix and an embedded clause. This means that successful operation of the Ga/No conversion in embedded clauses indicates the L2 learner’s discrimination between a matrix and an embedded clause as well. Of note, the rule, “SUBJ has to be marked with ‘ga’ regardless of the information structure in embedded (relative) clauses”, does not apply to a clause with the complementizer ‘to’. Therefore, the activation of the rule is restricted with relative clauses.

(i). $NP \rightarrow (S)_{ROOT=-}\ (NP)\ (AP)\ N$

e.g.,

25) $[_{NP}\ [_{S}\ [_{N}$ Hahaoya-ga] $[_{VP}\ \mathbf{[}_{N}\ \mathbf{]}_{i}\ [_{V}$ tukutta]]] $[_{N}$ sushi$_{i}$]]

mother-NOM make-PAST Sushi

‘The sushi which (his/her) mother made’

As seen in phrase y) above, there are square brackets containing N with no word. This intuitively reflects that the modified noun ‘sushi’ ‘originates’ from a position in the associating sentence modifier, indicated by the empty square brackets (Tujimura, 2007). This points out that these two Ns may be co-indexed, indicated by small ‘i’s. This co-indexed relationship may account for a mapping processing procedure. Sentence z) is sentence v), discussed earlier, together with grammatical functions.

e.g.,

26) Takashi-ga [Hahaoya-ga [ ]$_i$ tukutta] sushi$_i$-o tabeta

Takashi-NOM-SUBJ mother-NOM-SUBJ (OBJ) make-PAST Sushi-ACC-OBJ eat-PAST

‘Takashi ate the sushi which (his) mother made’

Since the N ‘sushi’ and the empty square brackets are co-indexed, the content of ‘sushi’ has two grammatical functions: one is realized as the OBJ of the PRED ‘tabeta’ and another is realized as the OBJ of the PRED ‘tukutta’. This notion is necessary not to violate the completeness condition of the f-structure, meaning that linking of the two functions needs to occur to indicate that one f-structure fulfills two functions, as shown in sentence z).

The position taken by ‘sushi’ is called ‘filter’ and the empty square brackets position is called ‘gap’ in LFG (Falk, 2001). The filter bears TOPIC in the f-structure because it occupies a discourse function position (called XP-position in PT) in the c-structure, and it is given information. In LFG, Wh-words must bear a discourse function, either TOPIC or FOCUS. Wh-words in interrogative sentences possess FOCUS, rather than TOPIC with relative pronouns (Falk, 2001), because it is not given information. Furthermore, another condition to fulfill in the f-structure is called the extended coherence condition which states that all functions in the f-structure (TOPIC, FOCUS, etc.) need to bear a grammatical function. Therefore, TOP and

FOCUS must link with grammatical functions either functionally or anaphorically (Kawaguchi, 2010).

According to Falk (2001), relative pronouns (i.e., Wh-words in English) bear TOPIC in the sub-f-structure with PRO (pronoun) realized as PRED (predicate) and WH realized as PRON (pronoun type). These are then connected to a gap to fulfill the completeness and the extended coherence condition in the f-structure. If there is no overt relative pronoun, like Japanese, an 'empty' PRO appears, without PRON, as DF (discourse function), rather than TOPIC, because no Wh-word appears to specify their function (neither TOPIC nor FOUCS). Then, based on the extended coherent condition, the DF (discourse function) needs a grammatical function as well. Therefore, the empty PRO links with the gap to bear the grammatical function. This fulfills the completeness condition at the same time. This would be a treatment for Japanese relative clauses.

In light of the LFG-based analysis, the mapping procedure of the discourse function (filter) and the gap, discussed above, is S-procedure (inter-phrasal), not S'-procedure (inter-clausal). This is because the linking process is at the same level as that of an interrogative sentence with a Wh-word in S-procedure in English PH, as well as OBJ topicalization in S-procedure in the Japanese PH. Figures 17, 18, and 19, below, exemplify c-structure and f-structure of an interrogative sentence with a Wh-word in English, the simplified f-structure of the OBJ topicalization operation, and the simplified f-structure of the relative clause mapping operation in Japanese.

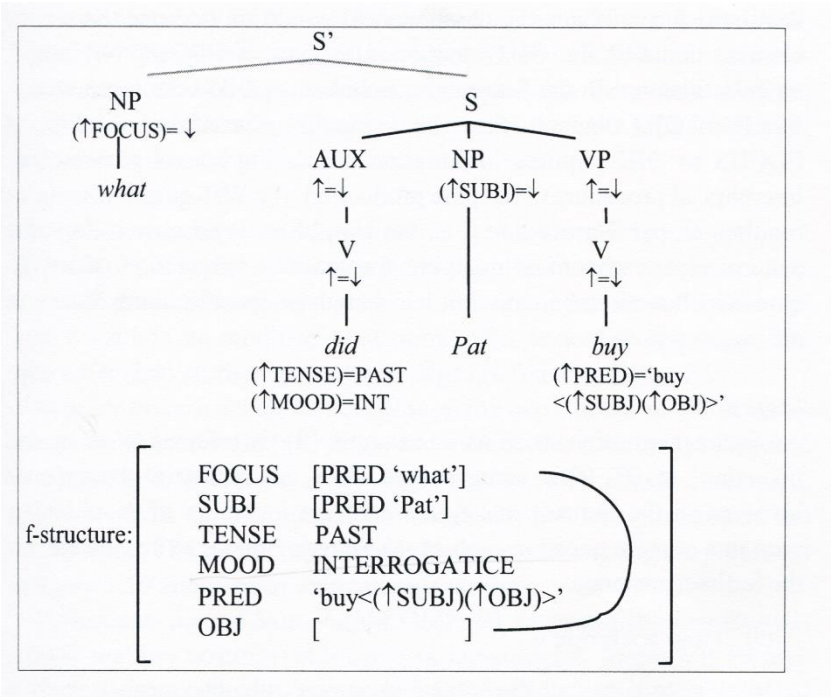


Figure 17: C-structure and f-structure for a Wh-question in English (taken from Van Valin, 2001, p. 192 as cited in Kawaguchi, 2010)

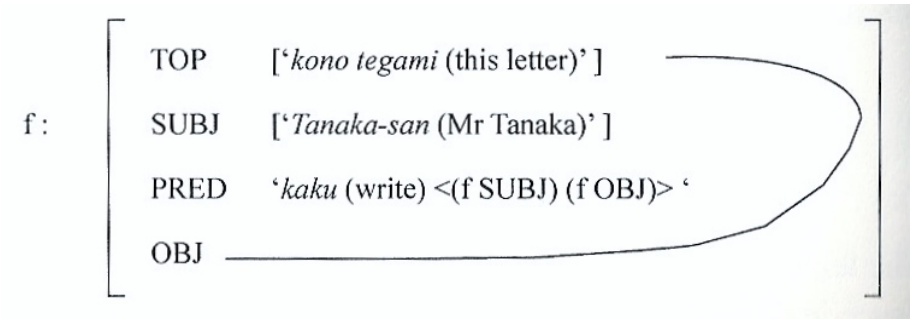


Figure 18: Simplified f-structure of 'Kono tegami-wa Tanaka-san-ga kaku''This letter, Mr Suzuki writes (taken from Kawaguchi, 2010, p. 124)

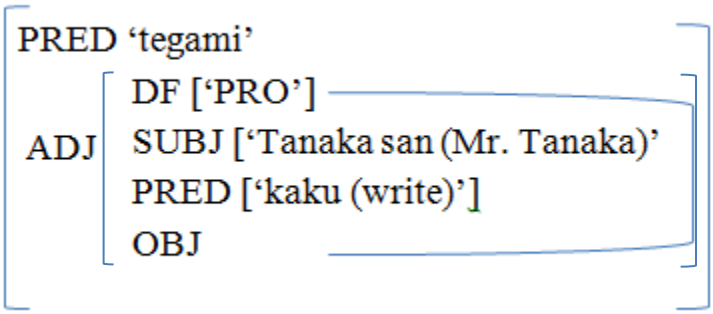


Figure 19: Simplified f-structure of 'Tanaka-san-ga kaku tegami' '(The) letter which Mr Tanaka writes'

Since the morphosyntactic constructions exemplified by figure 17 and 18 are categorized as S-procedure constructions based on their level of linking processes, I suggest that the 'wa' and 'ga' particle distinction in embedded/relative clause construction should belong to the S-procedure, rather than S'-procedure, in the Japanese PH. This is because, as seen in figures 17, 18 and 19, although the construction exemplified by figure 19 needs learner's discrimination between matrix and embedded clauses, all of the three constructions possess the same level of linking procedure in their f-structures. Furthermore, the syntactic construction in English—the so-called 'cancel inversion'—is claimed to require the S'-procedure by Pienemann (1998b, 2005). However, the same treatment as above applies to the operation as well. This also suggests that the construction should belong to Stage 4, S-procedure. This indicates that further examinations may be required to refine the S'-procedure/Stage 5 criteria because morphosyntactic constructions in the S'-procedure/Stage 5 should have a higher level of mapping procedure than that of Stage 4, based on the principles of PH formalized by LFG. In other words, 'information exchange between clauses' should be the criteria for the S'-procedure, based on the theoretical principles of PH formalized by LFG. However, Pienemann's criteria for the S'-procedure, 'matrix and subordinate clause distinction', does not demand a higher level of

mapping procedure than that of Stage 4. This may contradict the theoretical principles of PH formalized by LFG. This is further discussed in the subchapter of 'discussion'.

In addition, a current version of LFG (e.g., Falk, 2001) that the recent PT (Pienemann, 2005) employs utilizes TYPE features, instead of the ROOT features, to specify what kind of Wh-word appears (i.e., Q (interrogative), REL (relative clause)). The TYPE feature can show matrix and embedded clause distinctions, and then activate the 'cancel inversion' operation. Therefore, it would be more suitable to employ the TYPE features, rather than the ROOT features, for the recent PT.

3.5 Conclusion

This chapter reviewed the S'-procedure in PH and the 'wa' and 'ga' case particle distinction in matrix and embedded (relative) clause construction to hypothesize LFG-based formal descriptions of the construction, based on the theoretical principles of PH. The hypothesized descriptions suggested that the construction should belong to Stage 4 (S-procedure) unlike what Kawaguchi (2007, 2009) and Pienemann (1998b, 2005) hypothesized. This also revealed that the S'-procedure may require further examination for its refinement based on the theoretical principles of PH.

In light of the hypotheses, I empirically test whether L2 learners sequentially follow the hypothesized Japanese PH including the newly hypothesized construction. The following chapter presents the employed research method, including type of data, participants' information, data elicitation tasks, instruments, data analysis procedure, and acquisition criteria.

Chapter 4. Method

4.1 Introduction

In the previous chapter, having hypothesized the LFG-based formal descriptions of the target construction, this study suggested that the construction, 'wa' and 'ga' distinction in embedded (relative) clauses, should belong to Stage 4 (S-procedure), rather than Stage 5 (S'-procedure), in PH unlike what Kawaguchi (2007, 2009) hypothesized. This is because, although the morphosyntactic construction needs L2 learner's discrimination between matrix and embedded clauses, the linking process which occurs in the operation is inter-phrasal. This suggests the need for refinements of the S'-procedure criteria in non-language specific PH.

In order to empirically test whether L2 learners sequentially follow the hypothesized Japanese PH, a cross-sectional study was conducted to validate the hypothesized Japanese PH, with a focus on the newly hypothesized target construction. This chapter presents the research method employed for the current study.

The present chapter is organized as follows. First, Section 4.2 introduces the research method, and Section 4.3 discusses types of data for this research. Section 4.4 then provides the information about participants, which is followed by Section 4.5 introducing the speech elicitation procedures and utilized instruments. Finally, Section 4.6 discusses the acquisition criteria and procedures of analysis.

4.2 Framework of the research

The goal of this study is to apply PT to spoken data of advanced learners of Japanese as a L2 to empirically test if the L2 learners sequentially follow the hypothesized Japanese PH, with a focus

on the higher stages in the PH. In doing so, the previous chapter hypothesized the LFG-based formal descriptions of the morphosyntactic construction that Kawaguchi (e.g., 2007) hypothesized to belong to Stage 5/S'-procedure. The hypothesized description have suggested that the construction should belong to Stage 4, S-procedure, although it requires discrimination of matrix and embedded clauses. On this basis, the revised hypothesized Japanese PH is seen below.

Table 7. Revised processing hierarchy of Japanese grammatical structures (based on Kawaguchi, 2009, 2010)

	Processing procedures	**Exchange of grammatical information**	**Japanese L2 morphsyntax**
? Stage 4?	Embedded clause procedure	Matrix and sub-clauses distinction and inter phrasal information	Particle 'wa'/'ga' distinction in main and sub-clause
Stage 4	Sentence procedure	Inter phrasal information	OBJ topicalization (i.e. TOPOBJ SV) Morpholexical operations (PASS, CAUSE, BENE)
Stage 3	Phrasal procedure	Phrasal information	TOP+SOV V-teV
Stage 2	Categorical procedure	None	Canonical order SOV TOPSUBJ OV (i.e. Nominal marking of semantic roles, V-Final) TOPOBJ OV
Stage 1	Word or lemma access	None	Single constituents Formulaic expressions

In light of the revised hypothesized Japanese PH, a cross-sectional study was carried out to investigate the acquisition sequence of morphosyntax in L2 Japanese, with a focus on the Stage 4 and 5 (S- and S'-procedures) in PH.

4.3 Type of data

Cross-sectionally collected spontaneous spoken data from 11 learners of Japanese as a L2 and three native Japanese speakers (as controls) was used for this research. This is because a cross-sectional study allows testing of the hypothesized PH against empirical data collected in a controlled setting with a larger number of participants. Since this research focuses on L2 learners' on-line speech production, the data was limited to spoken data. This sort of data has also been employed to test the hypothesized developmental sequences for other languages within PT-based research (e.g., Di Biase & Kawaguchi, 2002; Mansouri, 2002; Zhang, 2001).

4.4 Participants

Eleven advanced learners of Japanese as a L2 and three native Japanese speakers (as controls) participated in the study. Table 8, below, shows the demographic data of all participants. Their names were substituted by numbers, for ethical reasons. The numbers of L2 Japanese-speaking participants based on their L1(s) are as follows: English (3), Mandarin (3), Korean (3), English and French (2), English and Hebrew (1). The participants who had two L1s either immigrated to Canada or moved in English speaking province from Quebec at an early age, and spoke a language other than English at home. They considered both the language used at home and English to be their L1s. A proficiency level of all the participants in L2(s) other than Japanese varied. All of the participants had no issues to communicate in English. The 11 participants were considered advanced learners of Japanese as a L2 based on the Japanese-Language Proficiency Test (JLPT), a standardized criterion-referenced test used to evaluate and certify Japanese language proficiency for non-native speakers of Japanese (Japan Foundation, 2014, Feb 1st). The JLPT has five levels: N1, N2, N3, N4 and N5, and the lowest level is N5 and the highest level is

N1. N4 and N5 indicate the basic level of understanding of Japanese (mainly learned in language class). N1 and N2 exhibit the level of understanding of Japanese used in a broad range of situations in everyday life. N3 is a bridging level between N1/N2 and N4/N5. All of the non-native Japanese participants had either N1 or N2 on the JLPT.

Table 8. Demographic data of all participants

Participant's number	JLPT	Sex	Age	languages	Relevant information
#1	N2	Female	23	L1:English/French	Was in Japan for 1 year as an exchange student.
#2	N2	Male	48	L1:Mandarin L2:English (advanced level)	Was in Japan for about 6 years (pursued PhD and worked at Japanese company).
#3	N1	Male	25	L1: Mandarin L2:English (advanced level)	Majored in Japanese, and went to Japanese as an exchange student for 1 year.
#4	N1	Male	20	L1:Mandarin L2:English (high-advanced level)	Has been studying Japanese.
#5	N1	Female	40	L1:English/French	Was in Japan for 8 years.
#6	N1	Male	33	L1:English/Hebrew	Was in Japan twice (for 5 months and 3 months).
#7	N2	Male	39	L1:English L2:French (beginner level)	Was in Japan for 2 years
#8	N2	Male	22	L1:English L2:French (advanced level)	Was in Japan for 1 year as an exchange student.
#9	N1	Female	24	L1:Korean L2: English (intermediate level)	Was in Japan 1 year as an exchange student.
#10	N1	Male	24	L1:English L2:French (beginner level)	Was in Japan for 3 years.
#11	N2	Female	25	L1:Korean L2:English/French (advanced level)	Was in Japan for 3 years when she was a baby.
#12	Control group	Male	33	L1:Japanese L2:English (high-intermediate level)	-
#13	Control group	Female	22	L1:Japanese L2:English (advanced level)	-
#14	Control group	Female	23	L1:Japanese L2:English (high-beginner level)	-

4.5 Data elicitation and instrument

A number of researchers have discussed the fact that L2 learners' linguistic performance varies depending on tasks (e.g., Schmidt, 1980; Larsen-Freeman and Long, 1991). L2 learners in open-setting tasks tend to be more fluent than in closed-setting tasks, while they tend to be more accurate in closed-setting tasks (Rahimpour, 1995 as cited in Kawaguchi, 2010). Furthermore, Robinson (1995) claimed that L2 learners' linguistic performance on 'here-and-now' tasks are more fluent than those on 'there-and-then' tasks, but their performance on 'there-and-then' tasks are more accurate than those on 'here-and-now' tasks. He stated that these performance differences are related to the fact that displaced reference ('there-and-then') to events involves a greater level of cognitive operation based on attention, memory, and reasoning demands.

Of note, although types and conditions of tasks affect accuracy and fluency of L2 linguistic performance, Rahimpour (1995) claimed that they do not affect the complexity of sentence structures produced by L2 learners. In addition, Pienemann and Mackey (1993 as cited in Kawaguchi, 2010) stated that tasks do not affect L2 learners' linguistic performance if these tasks test the same skill. This led Pienemann (1998b) to propose his 'steadiness hypotheses', which posits that "the basic nature of the grammatical system of an IL does not change in different communicative tasks as long as those are based on the same skill type in language production" (Pienemann, 1998b, p. 273). He tested the hypothesis with six learners of English as a L2. Each of them carried out six different communicative tasks. The interlanguage (IL) profiles of all of the learners were consistent across all tasks based on an 'emergence criterion'. This indicates that task variations do not affect L2 learners' linguistic performance if it is based on the same skill type in language production, and the emergence criterion is employed. Therefore, the

emergence criterion is employed for this research, which is further discussed in the subchapter later.

On this basis, two types of tasks were employed in this study: a mini semi-structured interview, and a picture-based task. The reason for this is that, as other L2 studies from a PT perspective have claimed (e.g., Pienemann, 1998b), although an oral interview provides 'naturalistic-like' speech data, it may have some issues in terms of L2 learners' distribution, such as 'one-word answers' from L2 learners (Long, 1981) and avoidance of certain linguistic structures (e.g., Schacheter, 1974). Therefore, various picture-based tasks were utilized in this research to elicit a range of morphosyntactic constructions. The data elicitation tasks were conducted as follows.

4.5.1 Elicitation tasks

First, a mini semi-structured interview was conducted to collect 'naturalistic-like speech data'. Questions asked to the participants were mostly about their demographic information, such as their name, L1, and so on. These questions allowed collecting morphosyntactic constructions that belong to low to intermediate stages in PH, Stage 1, 2, and 3. In addition, this interview was conducted for the participants as a warm-up exercise to eliminate their nervousness to talk with the researcher in a one-to-one situation in their L2, and be ready to carry out upcoming tasks.

Second, a picture-description task was conducted. The participants described in Japanese 13 different pictures showing events and activities (please see appendix A). They were encouraged to describe these pictures in as much detail as possible. They received the pictures one by one, and had one minute to think about how to describe each before starting. In order to establish linguistic contexts in which the participants could reliability use the target constructions, I created most of the pictures, and adopted the rest from Kawaguchi's research (2010). These

pictures verify the existence of linguistic contexts for the target constructions, including passive, causative, beneficative, and matrix and embedded clause constructions. This allowed eliciting a range of morphosyntactic constructions which appear in the hypothesized Japanese PH. Pictures #1 to #8 (please see appendix A) provided linguistic contexts in which the participants could use the 'wa' and 'ga' particle distinction in matrix and subordinate clause construction. Each picture contained two illustrations. The participants had to initially describe the first illustration, and then described the second illustration. The first illustration showed a person doing something, such as reading a book, and in the second illustration the person (or another person) was doing something else related to what the person in the first illustration was doing, such as looking for the book that s/he was reading in the first illustration. In order to describe the second illustration, the information given by the first illustration was required. Since they were requested to describe the illustrations as much detail as possible, they would use embedded clauses with the given information by the first illustration to provide detailed information about the second illustration. The participants who could distinguish between matrix and embedded clauses, and knew the rule of obligatory use of 'ga/SUBJ' within embedded clauses, would produce sentences with embedded clauses with case particle 'ga'. For example, picture #1 (please see the appendix A) had the illustrations. There was a girl painting in the first illustration, and in the second illustration, there was a boy praising the painting that she painted. Examples of sentences that the participants would produce are as follows. The same principle applies to the rest of the pictures, #2 to #8.

- *ki* *to* *yama-no* *e-o* *kai-teiru* *onnanoko-ga* *imasu*
  tree and mountain-GEN painting-ACC paint-PROG girl-NOM exist-POL
  'There is a girl painting trees and mountains'.

- *sono onnanoko-ga kai-ta e-o home-teiru otokonoko-ga imasu*
  that girl-NOM paint-PAST painting-ACC praise-PROG boy-NOM exist-POL
  'There is a boy praising the painting that she painted'.

Pictures #9 to 11 (please see appendix A) provided linguistic contexts in which the participants could use the passive and beneficative constructions. Again, each picture contained two illustrations. The participants initially described the first illustration, and then described the second illustration. The first illustration displayed some sort of accident happening to a person, and another person witnessed the accident, such as being hit by a car, or having her/his wallet stolen. In the second illustration, the person who witnessed the accident helped the person who had the accident, such as buying medicine for him/her, calling police for him/her, or taking the person to a hospital. The participants who have already acquired the processing skills for passive and beneficative constructions would produce sentences with these constructions. For instance, picture #10 (please see the appendix A) consisted of two illustrations. There was a boy who was hit by a car and a man witnessed the accident in the first illustration. In the second illustration, the man said to the boy "Get into my car. You have to go to a hospital!" Then, the man was going to take him to a hospital. Examples of sentences that the participants would produce are as follows. The same principle applies to the rest of the pictures, #9, #11, and #12.

- *otokonoko-ga kuruma-ni hik-aremashi-ta*
  boy-NOM car-DAT hit-PASS- POL-PAST
  'The boy was hit by a car'.

- *otokonohito-ga sono otokonoko-o byouin-ni ture-te-itte age-mashi-ta*
  man-NOM that boy-ACC hospital-DAT Take-XCOMP-go give-POL-PAST
  'The man gave a ride to a hospital for him'.

Picture #12 and #13 provided linguistic contexts in which the participants could use the causative constructions. These pictures were adopted from Kawaguchi's research (2010). These pictures contained small 9 illustrations showing a girl being mad at her senior worker because he made her do extra work, such as doing overtime, or working on a weekend (please see Kawaguchi (2010) for details and the pictures). One of the small pictures said *'konna jooshi wa kirai'* 'I hate such a senior worker'. The participants described the rest of the 8 pictures one by one. The participants who have already acquired the processing skills for the causative construction would produce sentences with the constructions. For instance, one of the illustrations consisted of the senior worker making her work on a weekend. An example of a sentence that the participants would produce is as follows. The same principle applies to the rest of the illustrations.

- *kanojyo-wa syuumatu-ni shigoto-o saseru jyooshi-ga kirai desu.*
  she-TOP weekend-DAT work-ACC make senior worker-NOM dislike is
  'She dislikes a senor worker who makes her work on a weekend'.

Finally, a story-telling task was conducted. A picture book entitled *Frog, where are you?* by Mercer Mayer (1969) was used. Since the book provides a rich context for language production, this picture book has been employed extensively in cross-linguistic experiments (e.g., Berman & Slobin, 1994; Reilly, Losh, Bellugi & Beverly Wulfeck, 2004). The book includes 24-pages/pictures without words, and is about a boy and his dog looking for their missing pet, a frog. The boy and dog come across various animals in the forest interrupting their search for the frog. The boy and dog eventually find the frog with his/her family. This story ends with the boy and dog leaving for their home with one of the frog's babies as their new pet. The participants told the story in Japanese based on the pictures in the book. They had three minutes to look at these

pictures before starting to tell their story. This task contained various linguistic contexts in which the participants could produce a number of different structures, including passive, causative, beneficative, OBJ topicalization, and matrix and embedded clause constructions, supporting the previous tasks to elicit a range of morphosyntactic constructions which appear in the hypothesized Japanese PH.

4.5.2 Recording and transcribing the spoken data

The oral responses to these tasks were recorded using an OLYMPUS digital voice recorder (VN-3200pc). All recording sessions were carried out in a study room or classroom at Carleton University. Each interview session was approximately 20 to 30 minutes long. The recorded interviews were transcribed using the Romanized Japanese system for distributional analysis.

4.6 Acquisition criteria and data analysis procedure

It is important to establish consistent, theoretically motivated acquisition criteria for L2 acquisition research because a theoretical notion of what the 'object' of acquisition is differs amongst theories (Jansen, 2000). Therefore, it is important to determine what a given study means by saying 'Stage X or linguistic structure Y is acquired'. Similar to other studies within the PT paradigm, this study adapted PT's definition of acquisition: 'being able to process a structure on-line' namely, obtaining the procedural skill to process a given operation, such as lexical, phrasal, and sentential operation of information exchange in spontaneous production.

Furthermore, previous research on PT has used 'emergence' as a criterion for acquisition. Pienemann (1998b) claimed that accuracy rate is not an appropriate measurement to investigate the acquisition sequence of morphosyntax because of the arbitrariness of a mastery criterion. In

contrast, emergence of a particular morphosyntax signifies that a certain procedural skill has been attained, and it is operational in interlanguage (IL). Pienemann (1998b) stated that:

> From a speech processing point of view, emergence can be understood as the point in time at which certain operations can, in principle, be carried out. From a descriptive viewpoint one can say that this is *the beginning of an acquisition process.* (Pienemann, 1998b, p. 138; emphasis added)

In other words, research from a PT perspective does not look at the state of mastery with percentage of correctness (i.e., the final state of the target language and its distance from the native speaker norm) (Håkansson, 2013). Rather, the research focuses on how the individual learner progresses from one stage to another by employing the emergence criterion. Therefore, in order to capture the dynamics of interlanguage (IL) development, the emergence criterion that could show structural processability is better suited (Håkansson, 2013). In addition, research points out that it is necessary in the utilization of the emergence criterion to sort out unanalyzed entries (i.e. formulaic and echoic sentences) from the learner's production to make sure of productive uses of morphosyntactic constructions (Di Biase & Kawaguchi, 2002). In order to exclude echoic or formulaic language, the distributional analysis verifies the productive operation of morphosyntax in an appropriate context by requiring that the production occurs more than once in lexically and structurally varied contexts (Pienemann, 1998b, 2005). On this basis, the present study employs the emergence criterion and that two emergence of the target structure in lexically and structurally varied contexts were considered evidence that it has been acquired, as have other studies in the PT paradigm.

Pienemann (1998b) also stated the importance of confirming the existence of an 'obligatory' context for targeted structures, rather than simply looking at the presence or absence

of a particular linguistic structure. However, it is difficult in Japanese to establish 'obligatory' contexts for targeted structures, especially for syntax, because (L1) Japanese speakers tend to pragmatically select a particular structure over another. This is mainly because Japanese lacks agreement systems (e.g., subject-verb agreement), and allows ellipsis with nominal arguments, nominal particles, and verbal predicates in several contexts (Kawaguchi, 2010). In this study, the picture-based tasks discussed earlier make sure of the existence of contexts in which Japanese speakers could use the target morphosyntactic constructions. In addition, this study looked at the number of valid instances of target structures in higher stages to provide further analysis of distributions for the target syntax, especially the 'wa' and 'ga' case particle distinction in embedded clause construction.

In light of this, distributional analysis was carried out on the transcribed data according to the revised hypothesized Japanese PH as seen table 7: Stage 1 (e.g., invariant forms), Stage 2 (e.g., lexical-semantic morphemes, etc.), Stage 3 (e.g., phrasal morphemes, etc.), Stage 4 (e.g., inter-phrasal morphemes, etc.), and Stage 4 (e.g., matrix and subordinate clause distinction hypothesized as Stage 4 in the present study).

4.7 Summary

This chapter recounted the method employed for the present study to test the validity of the newly hypothesized Japanese PH. The research method followed Pienemann's (1998b, 2005) proposals. This chapter included the type of data, participants' information, speech elicitation procedure and utilized instruments, emergence as an acquisition criterion, and the refined distributional analysis to exclude formulaic and echoic productions. The next chapter presents the results and discussions of the cross-sectional research.

Chapter 5. Results and discussion

5.1 Introduction

The previous chapter showed the research method employed for the present study (i.e., the data analysis procedure, the acquisition criteria and the participants' information) to test the validity of the newly hypothesized Japanese processability hierarchy (PH). This chapter reports and discusses the results of the cross-sectional research, based on the acquisition criteria and the data analysis procedure discussed in the previous chapter.

This chapter begins by presenting the results of the distributional analysis based on the newly hypothesized PH. This is followed by the discussion of the results of the distributional analysis, with a focus on morphosyntactic constructions that belongs to the higer stages, especially the 'wa' and 'ga' case particle distinction in embedded clause construction.

5.2 Results

The following section presents and discusses the results of the distributional analysis of the cross-sectional research according to the newly hypothesized Japanese PH. The results are presented stage by stage, and the presentation is accompanied by descriptions of the distributional analysis procedures for each morphology and syntax, especially for the higher stages. Then, the implicational table of all of the participants' production and acquisition of L2 morphosyntactic constructions is presented. This is followed by the discussion of the results of the distributional analysis.

5.2.1 Stage 1: Word or lemma access

This 'single constituents and formulaic expressions' stage is considered a pre-morphology stage, at which no morphological variation is expected (Kawaguchi, 2010). Though several participants displayed the invariant form of verbs and nouns without marking a semantic role, all of them showed variant forms of verbs and nouns with marking of the semantic roles. Therefore, it is assumed that all participants have already passed Stage 1.

e.g., Participant, #1

(1) *sugoku* *yasashii* *hito…*
very kind person
'very nice person'

e.g., Participant, #10

(2) *un,* *meue* *no* *hito*
yeah, senior of person
'yeah, senior person'

5.2.2 Stage 2: Categorical procedure

For the categorical procedure stage, variant verb inflections are observed, such as Vstem-POL(ite)-PRES(ent), Vstem-POL(ite)-PAST, Vstem-POL(ite).NEG(ation), Vstem-POL(ite).NEG-PAST, Vstem-PLAIN.PRES(ent), and Vstem-PLAIN.PAST. Echoic uses of inflections (i.e., the participants used the same inflectional form with the same lexical item as the interviewer's utterance (L1 Japanese speaker)), and potential formulaic sequences (i.e., the participants repeatedly used the same inflectional form with the same lexical item) are treated as insufficient evidence in the distributional analysis, as discussed in the previous chapter.

Morphological marking of the semantic roles on nouns, which leads to canonical order (e.g., SOV and $TOP_{SUBJ}OV$) is observed at stage 2. As described earlier, a verb (of matrix clauses) needs to be placed at the final position of the sentence in Japanese, with nouns morphologically marked for their semantic roles. The sentences must have a verb at the final position, with at least one noun that is morphologically marked for the semantic role in order to count it as positive evidence. All participants exhibited several inflectional forms of verbs as well as morphological marking of semantic roles on nouns in the canonical order. Therefore, it is assumed that all participants have already passed Stage 2.

e.g., Participant, #3: verb inflection

(3) *...benkyoushim-ashita* *kara…*
…study-POL-PAST therefore
'(I) studied 3 years for (the Japanese test); therefore…'

e.g., Participant, #7: Canonical order (TOP_{SUBJ} OV)

(4) *...furansugo-mo* *tiyyoto* *hanas-emasu*
French also a little bit speak-POTEN-POL-PRES
'(I) also can speak French a little bit.'

5.2.3 Stage 3: Phrasal procedure

The verbal structure 'V-teV' was treated as the phrasal procedure based on the function of the second verb as discussed earlier (e.g., ASPECT—V-*te imasu*, REQUEST—V-*te kudasai*, and OTHERS—e.g., V-*te okimasu*). TOP+SOV structure (i.e., SOV with non-core argument phrases, including an adjunct and locative) is also considered the phrasal procedure.

All participants showed a number of morphological structures belonging to the stage. However, only one participant produced the TOP+SOV structure. This may be due to, as

discussed in the previous chapter, speakers' pragmatic selection of a particular structure. Therefore, this does not mean that the participants who did not produce the construction have not yet acquired the morphosyntactic construction. Based on the theoretical principles of PT, since all participants produced morphology that belongs to the stage, all participants should have already acquired the phrasal processing procedure skill (or they, at least, started acquiring the processing procedure skill (Pienemann, 2005)). Thus, it is assumed that all participants have already arrived at Stage 3.

e.g., Participant, #2: V-te V

(5) *6 nen-han gurai nihon ni itte-imashita*
6 year-half about Japan to go-COMP-ASPE-POL-PAST
'I had gone to Japan for about 6 years and half.'

e.g., Participant, #8: TOP+SOV

(6) *Kare-wa ano.. Suzuki-san-ga suugaku-ga totemo joozu da.. to shitteimasu*
He-TOP ah… Suzuki-Mr-NOM math-DAT very skillful is COMP know-COMP-ASP-POL-PRES
'He knows that Mr. Suzuki is skillful at math.'

5.2.4 Stage 4: Sentential procedure (S-procedure)

As discussed earlier, passive, causative, benefactive, and OBJ topicalization constructions involve a non-canonical mapping process of thematic roles onto the f-structure, which requires S-procedure processing (e.g., Kawaguchi, 2005, 2007). Japanese extensively employs ellipsis to avoid lexical redundancy, and increase discursive cohesion (e.g., Kawaguchi, 2000, 2005). Due to the frequent use of nominal ellipsis, the S-procedure is not often syntactically visible. In addition, owing to a lack of gender and numerical morphology, nominal ellipses are not morphologically recoverable either (Kawaguchi, 2000, 2010). If no overt argument in passive,

causative, and benefactive sentences occurs, the insertion of passive, causative, and benefactive morphology to the base verb is merely a lexical operation. This does not require S-procedure processing (Di Biase & Kawaguchi, 2002); therefore, an overt expression of at least one argument is required to claim positive evidence for S-procedure.

In passive structures, either a patient (linked to subject) or agent (linked to adjunct) should be overtly expressed to count it as positive evidence because the linking of both patient as subject (marked as TOP or NOM), and agent as adjunct (marked as DAT) are considered non-canonical mapping processing (Kawaguchi, 2000, 2010). Similarly, positive evidence for causative and benefactive constructions can be observed only when the causer/benefactor (i.e., SUBJ) and the 'causee'/beneficiary (i.e., OBJ) are overtly expressed with appropriate nominal marking (SUBJ marked as TOP or NOM, and OBJ marked as ACC or DAT). This means, at least two arguments with appropriate nominal markings needs to be explicitly encoded with causative and benefactive constructions to count it as positive evidence (Kawaguchi, 2005, 2007, 2010).

Positive evidence for OBJ topicalization construction requires all arguments to be overtly expressed with appropriate nominal markings (TOP_{OBJ} SV). This is because the 'TOP_{OBJ} SV' construction with elliptic TOP_{SUBJ} 'TOP_{OBJ}V' would be the same construction as SOV with elliptic SUBJ 'OV' at the surface-level. Therefore, in order to verify the occurrence of OBJ topicalization, all arguments overtly expressed with appropriate nominal markings are essential.

All participants produced either passive, causative, benefactive, or OBJ topicalization constructions. Some produced all or most of these constructions, but some others produced only one of the constructions. In addition, the number of productions for each construction varied for every participant. Table 9, below, shows the number of productions for each construction for

each participant. Similar to Stage 3, in terms of a theoretical perspective of PT, since all participants produced at least one morphosyntactic construction that belongs to Stage 4, all participants are considered to have acquired the sentential processing procedure skill (or they at least have started acquiring the processing procedure skill, (Pienemann, 2005)). Thus, it is assumed that all participants have already reached Stage 4, S-procedure.

e.g., Participant, #4: passive construction

(7) *Kare-wa .... bee, ... hati-ni sasarete kusuri-ga iru rashii*
He-TOP bee bee-DAT is stung-COMP medicine-NOM need seem
'He was stung by bee and (he) seems to need medicine'

e.g., Participant, #6: causative construction

(8) *...kopii-o saseru jyoosi-ga kirai desu-ne.*
Copy-ACC make senior worker-NOM dislike is-discourse marker
'(She) dislikes the senior worker who makes (her) photo-copy (something).'

e.g., Participant, #2: benefactive construction

(9) *Jyoushi-ni koohii-o tukutte agete-imasu*
senior worker -DAT coffee-ACC make-COMP give-COMP-ASPE-POL-PRES
'(She) is making a coffee for the senior worker.'

e.g., Participant, #5: OBJ topicalization construction

(10) *CD-wa nusunda… Otokonohito-ga*
CD-TOP stole-PLAIN-PAST the man-NOM
'As for CD, the man stole.'

5.2.5 'wa' and 'ga' distinction in embedded clauses

Kawaguchi (2007, 2009) hypothesized that the morphosyntactic construction, 'wa' and 'ga' case particle distinction in matrix and embedded clause (i.e., SUBJ has to be marked with 'ga'

regardless of the information structure in embedded clauses), would belong to Stage 5 in the Japanese PH. However, this study hypothesized that the construction would belong to Stage 4 based on the level of mapping processing procedure. Once again, since Japanese extensively allows ellipsis with nominal arguments to avoid lexical redundancy, the nominal argument with 'ga' is frequently omitted based on speakers' pragmatic selections. However, in order to claim positive evidence for this operation, an overt expression of the nominal argument with 'ga' is necessary. Therefore, the elicitation tasks discussed earlier provided the participants with linguistic contexts in which speakers could overtly express the nominal argument with 'ga' in embedded clauses.

All participants from the control group (three native Japanese speakers) produced the nominal argument with 'ga' (or 'no' as the ga/no conversion) in embedded clauses. However, only six out of 11 L2 Japanese-speaking participants uttered the nominal argument with 'ga' (or 'no' as the ga/no conversion) in embedded clauses. Again, in light of the PT principles, since all participants produced at least one morphosyntactic construction that belongs to Stage 4, all participants are considered to have already acquired the processing skill for the 'wa' and 'ga' distinction in embedded clause construction (Pienemann, 2005). This is because this construction has been hypothesized as belonging to Stage 4. This is further discussed in the next section.

e.g., Participant, #10

(11) *kare-wa* *e-ga* *sukidesu…* ***kanojo-no*** *egaita* *e-ga* *sukidesu.*
He-TOP painting-NOM like-PRES she-GEN paint-PAST painting-NOM like-PRES
'He like the paint, the paint that she painted.'

e.g., Participant, #6

(12) ***kanojo-ga*** *tukutta* *keeki-o* *wakete* *tabeteiru…*
She-NOM make-PAST cake-ACC divide-COMP eat-COMP-ASPECT…
'(They have) divided the cake (that) she made, and (they) are eating…'

In sum, table 9, below, illustrates all analyses. The first row shows numbers assigned to the participants. The first column represents stages and morphosyntactic constructions based on the newly hypothesized Japanese PH (i.e., stage 1 to 4 and the 'wa' and 'ga' distinction in embedded clauses). [+] indicates that the hypothesized morphosyntactic constructions belonging to the stage were produced, and considered acquired by the participant. [–] shows that the morphosyntactic constructions belonging to the stage were not observed. Since this study focuses on higher stages, the total numbers of productions of the morphosyntactic constructions for higher stages are provided; the numbers represent the total number of productions of the morphosyntactic constructions.

Table 9. Implicational table of the participants' production and acquisition of L2 morphosyntactic constructions

Participant	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12C	#13C	#14C
'wa' and 'ga' distinction in embedded clause	–	–	–	–	–	+	+	+	+	+	–	+	+	+
'wa' and 'ga' distinction in embedded clause	0	0	0	0	0	4	3	2	2	6	1	2	6	2
Stage 4	+	+	+	+	+	+	+	+	+	+	+	+	+	+
OBJ Stage 4	0	0	0	0	0	0	1	1	0	1	0	2	0	0
BENE Stage 4	0	1	2	0	0	0	0	2	0	2	0	0	0	0
CAUSE Stage 4	0	0	3	0	1	2	9	7	6	6	1	9	4	5
PASS Stage 4	2	7	7	5	3	3	9	6	4	5	2	6	4	6
Stage 3	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Stage 2	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Stage 1	+	+	+	+	+	+	+	+	+	+	+	+	+	+

*Note: C = Control group (native Japanese speaker); OBJ = OBJ topicalization construction; BENE = benefactive construction; CAUSE = causative construction; PASS = passive construction.

5.3 Discussion

In light of the results of the distributional analysis, all participants exhibited a conclusive pattern as PT predicts [Stage 1 < Stage 2 < Stage 3 < Stage 4], suggesting that the hypothesized stages were empirically valid. This supports that the acquisition of these processing procedures at the lower levels in the hierarchy are prerequisites for the higher levels, and L2 learners must sequentially complete each stage. However, although the 'wa' and 'ga' distinction in embedded clause construction was hypothesized as a Stage 4 morphosyntactic construction, there appears to

be ‘a boundary’ between the other Stage 4 constructions and the ‘wa’ and ‘ga’ distinction in embedded clause construction. Seemingly, participants #1 to #4 have not yet acquired the ‘wa’ and ‘ga’ distinction in embedded clause construction even though they have already acquired the other constructions at the stage. This may suggest that the ‘wa’ and ‘ga’ distinction in embedded clause construction somehow belongs to ‘a higher stage’ than the rest of the constructions although all of them should belong to Stage 4 in light of the LFG-based analysis. In order to validate the categorization of the construction to Stage 4, I believe that further LFG-based analysis is crucial for the construction. This is further discussed later.

Moreover, the ‘wa’ and ‘ga’ distinction in embedded clause construction requires L2 learners to distinguish embedded clauses from matrix clauses; therefore, the construction was originally categorized to the S’-procedure/Stage 5. However, the hypothesized descriptions in the present study revealed that the construction should belong to the S-procedure/Stage 4 because of the inter-phrasal level of mapping procedure. Based on the theoretical principles of PH formalized by LFG, it is expected that constructions require a mapping process between clauses if they belong to the S’-procedure/Stage 5. This is because constructions in the S’-procedure/Stage 5 should demand a higher level of mapping procedure than inter-phrasal mapping procedure, based on the theoretical principles of PH formalized by LFG. As discussed, a number of researchers (e.g., Kawaguchi, 2007, 2009; Ågren, 2007) have assumed that grammatical information exchange occurs between clauses in constructions belonging to the S’-procedure/Stage 5 based on the theoretical principles of PH. However, as discussed earlier, Pienemann (1998b, 2005) does not state that inter-clausal information exchange occurs in Stage 5. Instead, he simply assumes that matrix and embedded clause distinction occurs after having acquired all of the processing skills of matrix clauses, without theoretical descriptions. This

indicates that the S'-procedure criteria may contradict the principles of PH formalized by LFG. Thus, it is necessary to account for LFG-based theoretical descriptions for the S'-procedure to verify that the information exchange between clauses occurs. Alternatively, further examination needs to carry out to theoretically account for why the annotation of [ROOT = −] feature in the f-structure is acquired after S-procedure using LFG-based analysis.

Of note, some of the participants did not produce some of the target morphosyntactic constructions belonging to Stage 4. For example, participants #1, #2 and #4 did not utter the causative construction although a sufficient number of linguistic contexts in which they could produce the construction provided. This leads to questions: what are the criteria for acquisition of a stage? Is acquiring one target construction in a stage actually sufficient to claim acquisition of the stage? Based on the theoretical description of PT, it is reasonable to assume that when one morphosyntactic construction in a stage is acquired, the other structures in the stage are simultaneously acquired. According to Pienemann (2005):

> One has to bear in mind that levels of processability are characterized by those processing procedures, which same-level structures have in common. In addition to this, the procedures for each of the structures also have to be acquired. There is no reason why a learner would necessarily acquire all same-level structures simultaneously as soon as the processing procedures have developed. (Pienemann, 2005, p. 115)

Pienemann's statement seems to imply that there is another hierarchy of processing procedures within each stage of PH, and therefore it is unreasonable to assume that all structures at each stage will be acquired at the same time once the learner has developed the 'framework' of processing procedure for the stage. However, PT does not address any of the 'micro-level hierarchy' of processing procedures in each stage. Thus, as Mansouri (2005, 2007) has suggested,

there may exist ‘intra-stages’ within each stage of PH, and each structure in the same stage is uniquely distinct and has a complex form-function mapping procedure. For example, some morphemes have a one-to-one relationship between form and function. However, others have a one to many form-function relationship, such as ‘–s’ in English because the ‘–s’ is used for genitive, plural and verbal agreement (Mansouri, 2007). The Japanese case particle ‘ga’ has one-to-multiple form-function relationship, such that ‘ga’ functions as NP/SUBJ and NP/OBJ, as discussed in the earlier chapter. As a result, form-function relationship analysis would be required to formalize the grammatical properties of these ‘intra-stages’, allowing for a more precise examination of a learner’s interlanguage (IL) development. In light of this, the form-function relationship analysis, in addition to the LFG-based analysis, would be required to validate the categorization of the ‘wa’ and ‘ga’ case particle distinction in matrix and embedded clause construction to Stage 4 and the intra-stage of the construction within Stage 4.

Alternatively, the results simply showed speakers’ pragmatic selections of particular structures. As discussed earlier, it is difficult in Japanese to establish obligatory linguistic contexts for target syntactic constructions. This is because Japanese allows speakers to pragmatically select a particular structure over another mainly due to a lack of agreement systems and an allowance of ellipsis with nominal arguments, nominal particles, and verbal predicates in several contexts (Kawaguchi, 2010). Since no ‘obligatory’ contexts was provided to use the ‘wa’ and ‘ga’ distinction in embedded clause construction, the participants utilized other morphosyntactic constructions. This could be because of the participants’ avoidance of the construction due to their uncertainty of usage of the construction, or because of their preference for an alternative construction in the contexts. All of the participants who did not produce the target construction uttered sentence (13) in the given contexts.

e.g., Participant, #5

(13) *kare-wa* *kanojo-no* *e-o* *hometeimasu.*
He-TOP her-GEN paint-ACC praise-COMP-ASPE-POL-PRES
'He is praising her painting.'

e.g.,

(14) *kare-wa* *kanojo-ga* *kaita* *e-o* *hometeimasu.*
He-TOP she-NOM paint-PAST paint-ACC praise-COMP-ASPE-POL-PRES
'He is praising the painting that she painted.'

The two sentences, above, convey *almost* the same meaning. However, sentence (13) is simpler than sentence (14) in terms of the feature unification and the lexical mapping procedures which occur when producing them. This suggests that it would be natural for them to select the simpler one to efficiently utter sentences so that the participants could direct their attention elsewhere to simultaneously carry out multiple psychological processing events.

Furthermore, all participants from the control group (i.e., Japanese native speakers) produced the 'wa' and 'ga' distinction in embedded clause constructions. This indicates the existence of linguistic contexts to produce the construction. However, the number of productions of the construction varied. This also shows that the participants from the control group also used sentence (13) instead of (14) in some of the given contexts. Consequently, it is not determinable from the results whether the participants did not produce the target construction because they had not yet acquired the construction, or they chose not to utter the construction even though they had already acquired it.

As a result, refinement of elicitation tasks would be required to provide a number of 'obligatory' linguistic contexts in which participants would produce the target construction, if they have already acquired the level of mapping processing skill, because the given contexts still allowed them not to use the target construction.

5.4 Conclusion

This chapter has shown and discussed the results from the cross-sectional research stage by stage, with descriptions of the distributional analysis procedures for each morphosyntactic construction. The results positively suggested that the newly hypothesized developmental sequence and stages are supported as in [Stage 1 < Stage 2 < Stage 3 < Stage 4]. However, the 'wa' and 'ga' distinction in embedded clause construction appeared to belong to a higher stage than the rest of the morphosyntactic constructions although all of the constructions should belong to Stage 4 in light of the level of mapping processing procedure. It is perhaps because of the existence of the intra-stages within each stage of PH, and the fact that each structure in the same stage is uniquely distinct and has a complex form-function mapping procedure, as Mansouri (2005, 2007) has suggested. Alternatively, the results might have simply showed speakers' pragmatic selections of particular structures due to the absence of obligatory contexts for the target construction.

In short, further LFG-based analysis and form-function mapping analysis are necessary for the 'wa' and 'ga' distinction in embedded clause construction to validate the categorization. Furthermore, the modification of the theoretical descriptions of Stage 5 in PH would be required because it is expected that constructions belonging to Stage 5 require a higher level of mapping procedure than that of Stage 4, based on the PH formalized by LFG. As well, the refinement of elicitation tasks would be required to provide linguistic contexts in which participants would reliably produce the target construction. These are further discussed in the next chapter.

The next chapter concludes this discussion by summarizing the major findings of the present study to discuss theoretical and pedagogical implications of this study as well as practical applications of them. This is followed by a discussion of limitations of the study and suggestions for future research.

Chapter 6. Conclusion

6.1 Introduction

The previous chapter showed that the hypothesized developmental sequence and stages were empirically supported. However, the 'wa' and 'ga' distinction in embedded clause construction appeared to belong to a higher stage than the rest of the constructions in Stage 4 although all of the constructions should belong to Stage 4 in light of the LFG-based analysis. This may be because of the existence of the intra-stages within each stage of PH due to the unique form-function mapping procedure for each construction, as Mansouri (2005, 2007) has suggested. On the other hand, the results possibly simply showed speakers' pragmatic selections of particular structures due to the absence of 'obligatory' contexts for the target structure.

This chapter concludes the discussion of the acquisition of advanced learners of Japanese as a L2 from a PT perspective. This chapter is organized as follows. Section 6.2 summarizes the major findings of this research, with discussion of the proposed research questions. Section 6.3 then discusses theoretical and pedagogical implications of the study, including practical applications of PH. Finally, section 6.4 addresses the limitations of the study and offers suggestions for future research.

6.2 Summary of findings

The main objective of this cross-sectional research was to examine advanced L2 Japanese learners' developmental sequence of morphosyntactic constructions from a PT perspective. This included hypothesizing LFG-based formal descriptions of the construction that Kawaguchi (e.g., 2007) has hypothesized to belong Stage 5, verifying whether the construction actually belongs to

the stage as Kawaguchi (e.g., 2007) hypothesizes, and empirically testing the hypothesized stages. The following section summarizes the major findings of this study, along with the proposed research questions. This is followed by implications of the outcomes of the present study.

(1) What are the formal descriptions of the morphosyntactic construction that belongs to Stage 5, 'wa' and 'ga' case particle distinction in matrix and subordinate clause (e.g., Kawaguchi, 2007) , in light of LFG-based analysis?

The 'wa' and 'ga' case particle distinction in embedded clause construction required [ROOT= −] feature to be appended to the embedded clauses to activate the Japanese-specific rule, SUBJ has to be marked with 'ga' regardless of the information structure in embedded clauses. As the phrase structure rule (i) earlier has showed, when NP consists of (S), the (S) must possess the [ROOT = −] feature. The (S) and the noun N (head) form the NP when the (S) is present. As well, the construction needed the mapping procedure of the discourse function (filter) and the gap to fulfill the completeness condition and the extended coherence condition in the f-structure in light of LFG-based analysis. Figure 15, earlier, showed the mapping procedure.

(2) In light of the LFG-based analysis, does the morphosyntactic construction actually belong to Stage 5 as Kawaguchi (2007, 2009) hypothesizes?

The 'wa' and 'ga' distinction in embedded clause construction carried out an inter-phrasal mapping process (S-procedure), not inter-clausal (S'-procedure) mapping process in light of the LFG-based analysis. As figures 18 and 19 showed, earlier, the mapping process of the construction was at the same level as that of OBJ topicalization in S-procedure in the Japanese PH. Therefore, this study suggested that the 'wa' and 'ga' distinction in embedded clause construction should belong to the S-procedure, Stage 4, in the Japanese PH, based on the principles of PH formalized by LFG. Moreover, the English morphosyntactic construction, cancel inversion, also should belong to the S-procedure in light of the level of mapping

processing procedure, unlike what Pienemann (1998b) claimed. This revealed that the S'-procedure (i.e., matrix and subordinate clause distinction) requires further examination to refine its definition in light of LFG-based analysis because the S'-procedure criteria (i.e., distinction between matrix and embedded causes) may contradict the principles of PH formalized by LFG (e.g., lexical mapping). The criteria for S'-procedure should be inter-clausal grammatical information exchange from a LFG-based formalism perspective because structures belonging to Stage 5 should have a higher level of mapping procedure than that of Stage 4, based on the principles of PH formalized by LFG.

(3) If so, do L2 learners sequentially follow the hypothesized Japanese PH including Stage 5, as PT predicts?

Although the 'wa' and 'ga' distinction in embedded clause construction was hypothesized to belong to Stage 4, the results positively suggested that the hypothesized developmental sequence and stages were supported as in [Stage 1 < Stage 2 < Stage 3 < Stage 4]. However, the 'wa' and 'ga' distinction in embedded clause construction appeared to belong to a higher stage than the rest of the constructions even though all of the constructions should belong to Stage 4 in light of the level of mapping procedure. Therefore, this study proposed the existence of the intra-stages within each stage of PH, based on the complexity of form-function mapping procedure, as Mansouri (2005, 2007) has suggested.

6.3 Implications

The results of this study provided supportive evidence for the PT notion that grammatical structures are acquired in a fixed sequence although this study revealed that a further investigation of grammatical properties of the intra-stages is required to allow for a more precise

examination of a learner's interlanguage development and grammatical proficiency. The following section discusses theoretical and practical implications of this study.

6.3.1 Theoretical implications

This study revealed that the S'-procedure, Stage 5 (i.e., matrix and subordinate clause distinction), requires further examination to refine its definition in light of LFG-based analysis because Pienemann's (1998b) criteria for Stage 5, the matrix and subordinate clause distinction, is presumably not compatible with the principles of PH formalized by LFG. In other words, structures belonging to Stage 5 should have a higher level of mapping procedure than that of Stage 4, based on the principles of PH formalized by LFG, but the criteria does not demand a higher level of mapping procedure than that of Stage 4. In addition, further LFG-based analysis and form-function relationship analysis are necessary for each morphosyntactic construction to formalize the grammatical properties of the intra-stages to account for the acquisition sequence differences among morphosyntactic constructions within each stage. This would allow for a precise examination of a learner's interlanguage development and grammatical proficiency in PT. For the L2 Japanese PH, it is important to identify possible stages for other constructions not yet categorized (e.g., a copula sentence, adjectival sentence, etc.) as well as conducting further LFG-based and form-function relationship analyses for the 'wa' and 'ga' case particle distinction in matrix and embedded clause construction to validate the categorization of the construction to Stage 4 and the intra-stage of the construction in Stage 4. Finally, the newly hypothesized constructions must be tested to determine whether they are empirically valid to refine the Japanese PH.

6.3.2 Pedagogical implications

As discussed, the results of this study provided supportive evidence for the PT notion that grammatical structures are acquired in a fixed sequence regardless of language. Therefore, each stage must be completed sequentially, and a learner cannot skip a stage. This indicates that language-specific PHs (not only the Japanese PH) have promising implications for providing 'research-driven practice' in the field of L2 education. For example, a language-specific PH can be used to organize the content of textbooks and syllabuses because the PH allows determination of which categories of grammatical structures should be taught, in what sequences. In addition, a language-specific PH can be utilized to measure interlanguage (IL) development to determine learners' grammatical proficiency level because the acquisition of grammatical structures at the lower stages is a prerequisite for the higher stages in the PH.

For instance, research by Pienemann, Kessler, and Itani-Adams (2011), Ellis (2008), and Keßler and Liebner (2011) investigated practical applications of PH and language-specific PHs. The first study (Pienemann, Kessler, and Itani-Adams, 2011) employed the PH as a 'metric' to compare levels of linguistic ability in two languages in a bilingual speaker in terms of the timing of emergence for each stage. Pienemann, et al. (2011) expected languages to be comparable with each other in terms of levels (stages) of processability because all developmental sequences in different languages come to one universal hierarchy of processability, PH. On this basis, Pienemann, et al. (2011) examined Itani-Adams' study (2007 as cited in Keßler and Liebner, 2011) of bilingual (Japanese-English) first language acquisition, and showed that the participant developed his/her linguistic ability in both Japanese and English according to the hypothesized Japanese and English PHs, but with different timing. On this basis, Pienemann, et al. (2011) claimed that the PH can be utilized as a measurement of language development across

typologically different languages based on the language specific PHs. The research concluded by suggesting that research needs to be carried out on any languages not yet having its language-specific PH because the PH allows for comparison of levels of linguistic ability cross-linguistically in bilingual speakers.

In order to utilize the language-specific PHs to precisely assess learners' interlanguage (IL) development and grammatical proficiency level, Ellis (2008) investigated which language data, elicited by different tests, can provide reliable information to determine what a learner knows using the PH as a measure of syntactic learning difficulty (He utilized the English-specific PH). The results suggested that the PH predicts language-learning difficulty based on implicit knowledge, not explicit knowledge. In light of this, Ellis (2008) proposed that learners' implicit linguistic knowledge based on the PH could be used to examine IL development, and determine learners' grammatical proficiency level. The study concluded by suggesting benefits for employing both the PH and implicit and explicit knowledge dichotomy for language testing.

Pienemann and Keßler (2011) introduced an English-specific PH-based computer program, called 'Rapid Profile'. This program is a tool for linguistic profiling to provide a computer-assisted screening procedure for the assessment of English as a L2. A researcher or trained teacher listens to speech data from empirical studies. The researcher or trained teacher then enters the PH-based information of the learners' morphosyntactic operation into the program to build a 'profile' of the L2 learner's interlanguage development. The program checks the morphological/lexical variations to assess whether the morphosyntactic construction can be considered acquired, determining whether the learner has arrived at a specific developmental stage. The program alerts an elicitation of more instances of specific morphosyntactic constructions if they are not sufficient to determine the acquisition of the morphosyntactic

construction. Finally, the profiles of the learners' interlanguage development organized by the program assist teachers to determine which morphosyntactic construction should be a focus for teaching. This is tightly related to the Pienemann's (1984, 1988b) teachability hypothesis, grammatical instructions promote L2 learning only when an L2 learner's interlanguage is ready to acquire instructed structures.

In short, the PH appears to have promising practical applications in the fields of curriculum design and assessment for language studies. However, In order to do so, it is necessary to identify possible stages for constructions not yet categorized as well as conducting form-function relationship analysis for the intra-stages of constructions in language-specific PHs.

6.4 Limitations of the study and suggestions for future research

This study has limitations, which require refinements in various ways to improve the research method and the outcome for future work. The next section discusses the limitations of the study. This is followed by suggestions for future research.

6.4.1 Limitations of the study

First, this was an exploratory study with a small number of research participants; the conclusions drawn may not be generalizable in supporting the hypothesized Japanese developmental stages. Second, not only a cross-sectional but also a longitudinal study should have been conducted to empirically observe the points of acquisition of the hypothesized constructions in time and their sequence. Third, as discussed earlier, the elicitation tasks should have provided contexts in which participants would reliably utter the target construction. It is significant to refine the elicitation tasks to reliably collect the target structures. Finally and most importantly, the discussion of differences between 'wa' and 'ga' is complex. This study employed the association of the

given/old information and topic construction as descriptions of differences between the two case particles. However, research studies focusing on the relationship between 'wa' and 'ga' tend to consider the association of the given/old information and topic construction to be a secondary phenomenon (e.g., Shibatani, 1990). A further analysis of the fundamental differences between the two case particles is still underway (Shibatani, 1990).

6.4.2 Suggestions for future research

Having discussed the limitations of this study, suggestions for future research are to investigate elicitation tasks to provide research participants with better contexts to be required to utter the target syntax, allowing identifying possible stages for other morphosyntactic constructions not yet categorized. Another suggestion is to conduct a longitudinal study as well as a cross-sectional study with a larger number of research participants, with a focus on advanced learners from a PT perspective. This would increase the validity of the outcomes of the present study. Third, as discussed earlier, LFG-based analysis should be carried out to further examine the S'-procedure, Stage 5 (i.e., matrix and subordinate clause distinction). This would refine the definition of the procedure, and make the procedure compatible with the principles of PT formalized by LFG. Finally, further form-function relationship analysis should be conducted for each morphosyntactic construction to formalize the grammatical properties of these intra-stages to account for the acquisition sequence differences among morphosyntactic constructions within each stage.

Of note, PT claims a fixed sequence of L2 morphosyntactic development constrained by spontaneous speech production skills and working memory capacity. The production skills contain transferring and mapping processes of grammatical information. This information mapping perspective could be extended to other aspects of mental representations of language

(e.g., phonological and semantic properties). In fact, mapping processes between prosodic, conceptual, and morphosyntactic structures have already been raised by Autonomous Induction Theory (AIT) (e.g., Carroll, 2001, 2007). The autonomous induction theory (AIT) posits L2 input processing procedures in light of the mapping processes between prosodic, conceptual, and morphosyntactic structures. Research studies employing AIT postulate that acquisition, creation of a novel mental representation, occurs as a result of a learner's unconscious analysis of input. The analysis consists of complex mapping procedures, associated with correspondence rules, between autonomous linguistic representations (i.e., phonological, morphosyntactic, and conceptual properties) created in distinct modules of the language faculty (e.g., Carroll, 2001; Jackendoff, 2002). In addition, AIT posits that L2 learners depend upon L1 processing procedures to analyze L2 speech signals on the first exposure, which could 'filter out' the primary linguistic data required for L2 processing procedures. However, research has shown that L2 learners are not completely constrained by their L1 properties in the analysis of L2 input (e.g., Carroll & Widjaja, 2013). Research suggests that an examination of numeric properties (e.g., singular/plural/count/mass), involving distinct patterns of mappings across phonological, morphosyntactic and semantic representations, and that the examination of non-western European languages, due to their unique properties, such as classifiers, will contribute to the advancement of the knowledge of L2 acquisition theory construction (e.g., Carroll & Widjaja, 2013).

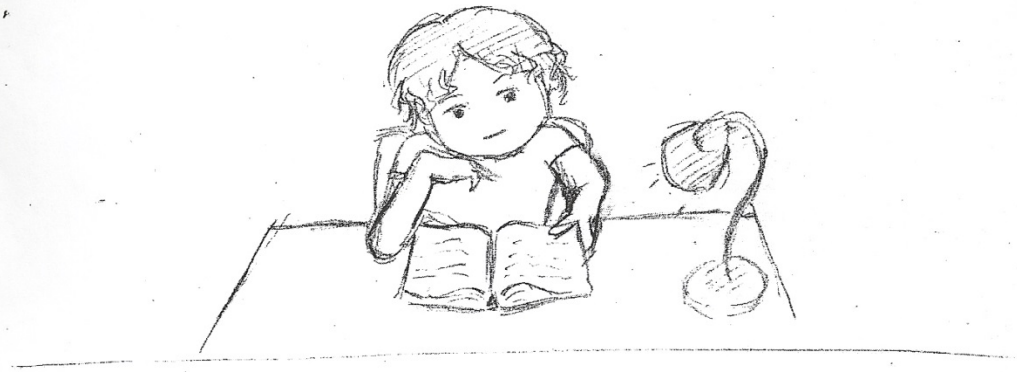
As a final note, PT is one of the promising theories in L2 acquisition because of the comprehensive explanation of L2 developmental patterns, although PT lacks the specifications of what triggers the learner to move from one processing stage to the next, and how it occurs (Rothman & VanPatten, 2013). However, since L2 acquisition is complex and consists of

different components (e.g., phonological, morphosyntactic, and conceptual properties) and their processing procedures, it is expected that multiple theories and hypotheses will appear in the field of second language acquisition (SLA). Each theory and hypothesis attempts to account for distinct properties of L2 acquisition. As Rothman and VanPatten (2013) have suggested, "[…] although various theories may be mutually exclusive in terms of domains of inquiry, this exclusivity does not put them in competition for overall explanatory adequacy. Instead, they actually may be complimentary (at least, in some respects)" (p. 251). However, I believe that future research within a PT perspective will carefully examine what the nature of interlanguage (IL) is, how it is constructed, and how the development of IL occurs to extend their theoretical perspectives, and encompass the other aspects of mental representations of language (e.g., phonological and conceptual properties) like the theory discussed above. "[…] the better a theory or framework can articulate [theoretical] constructs, the more likely it is to lead us to a deeper understanding of SLA as well as an account that can lead to testable hypotheses" (Rothman & VanPatten, 2013, p. 249).

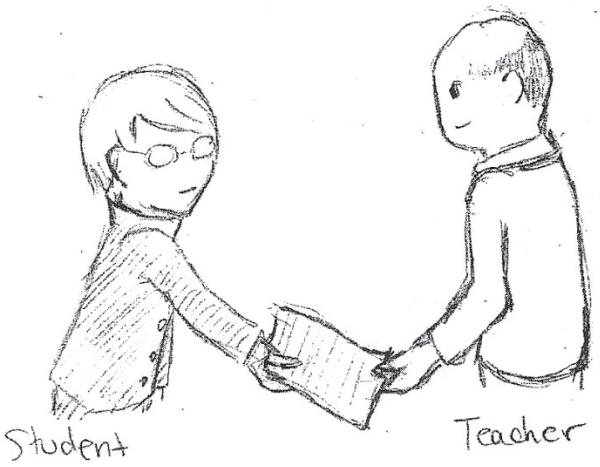
Appendices

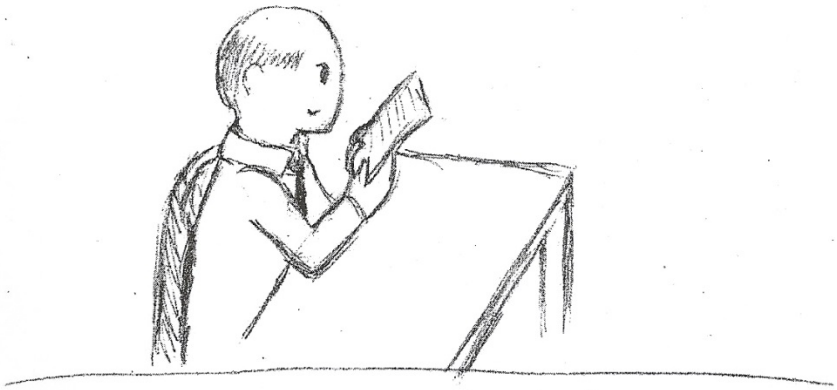
Appendix A. Sample pictures used in the elicitation task

2.



3.

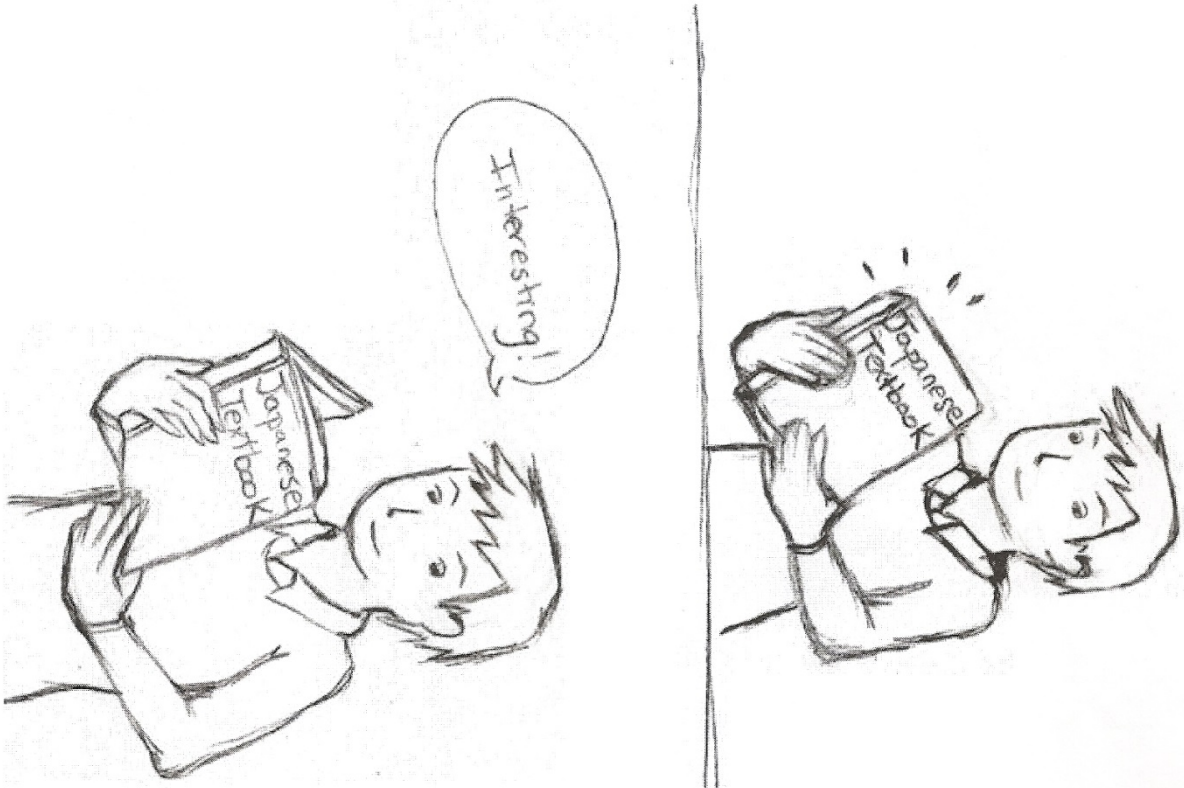





4
MATH
Oh, It's Suzuki-San who is good at math!

5

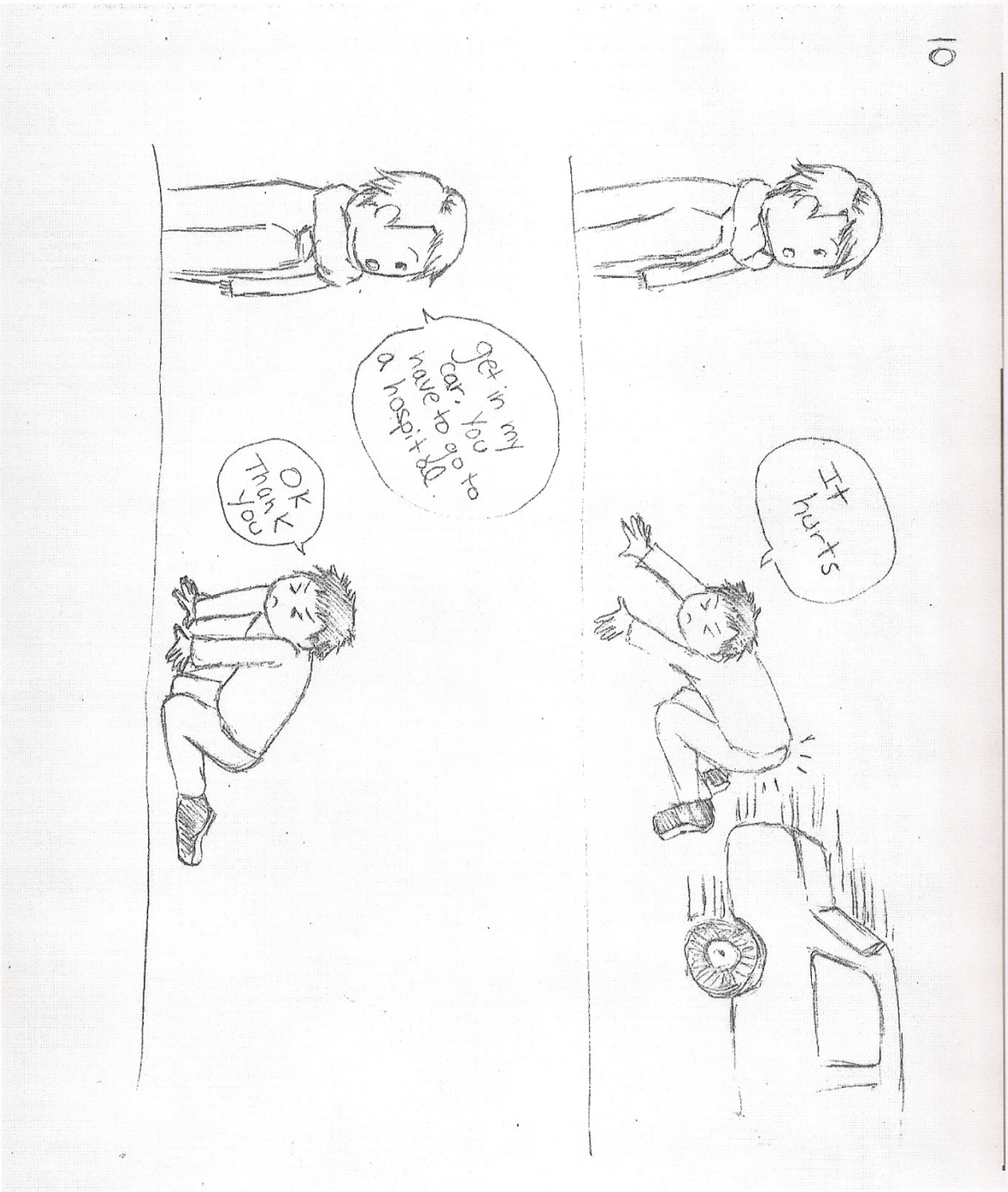
6

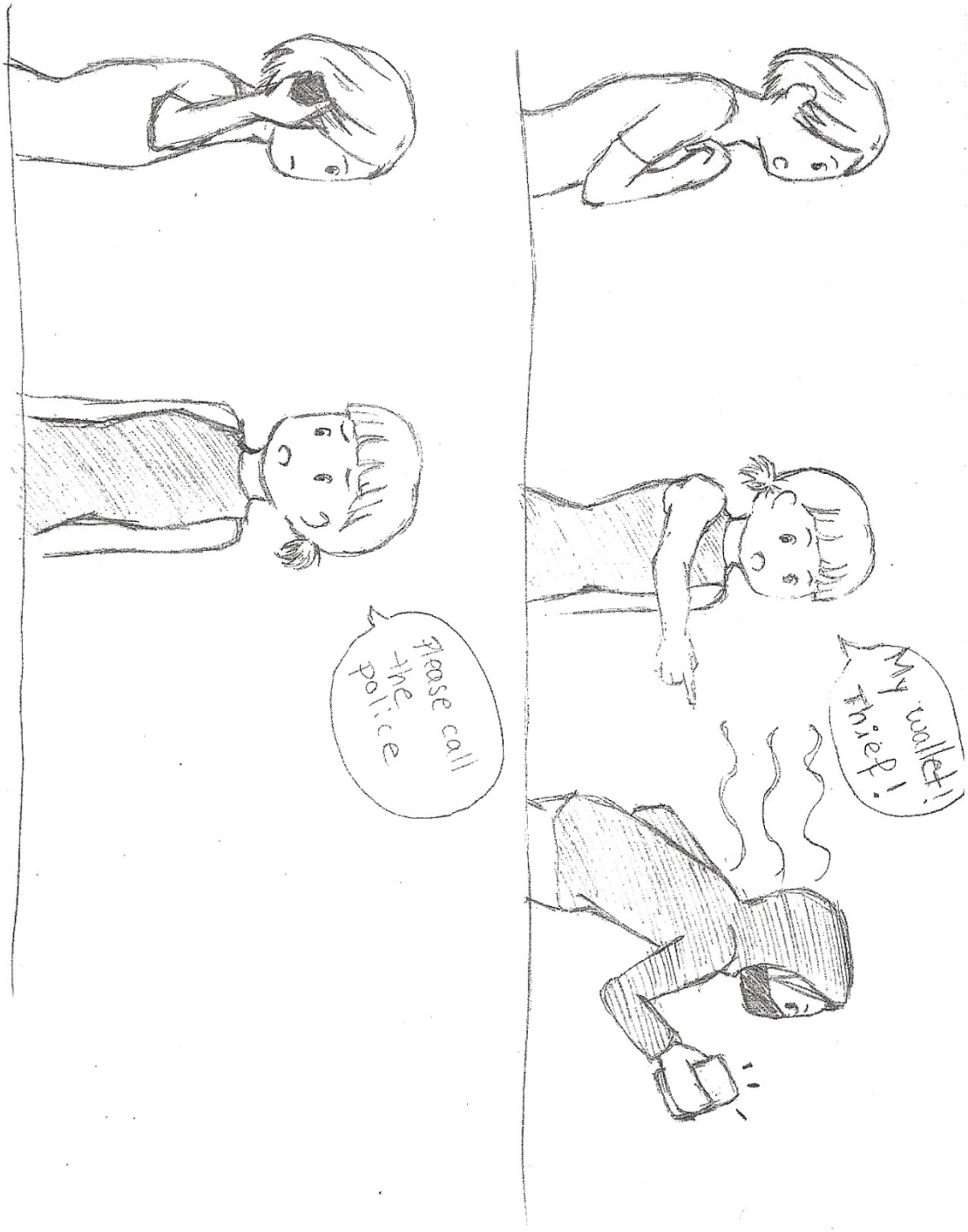


7


8
Music Shop
1 CD
Thief!


9.
Ouch!
I need a medicine
Here is your medicine
Thank you.


10
It hurts
Get in my car. You have to go to a hospital.
OK Thank You


My wallet! Thief!
Please call the police

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