

A Unificational Mechanism for Morphological Developmental Sequence

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The present study examines the question on what mechanism operates on the development of L2 morphology, and how Pienemann's Morpheme Processability Hierarchy (Pienemann, 1998, Pienemann & Håkansson, 1999) can be extended. For the questions, this study proposes a unificational (morphological) mechanism (UM) by extrapolating the Uniqueness Condition (UC) to the syntactic developmental sequence on X-bar formats in the Minimalist program (Chomsky, 1992). Consequently, the UM not only governs the unification processes of grammatical features or morphemes in real time, but also determines the implicational syntactic domains or scopes on which the UC operates, or in which feature unification takes place. According to the UM, this study proposes a revised Morphological Developmental Sequence (MDS) extended from Pienemann's Morpheme Processability Hierarchy based on the UC. Thus, the MDS can explain the interactional processes of morphological development with syntactic development more systematically by incorporating cognitive mechanisms and linguistic mechanisms according to the Modular Approach (Ellis, 1994; Gregg, 1996; Pienemann, 1998).

Key words: unificational mechanism, uniqueness condition, morpheme processability hierarchy, morphological developmental sequence

1. Introduction

What mechanism operates on the development of L2 morphology, and how is it developed? There are very few, if any, studies which have examined morphological interlanguage (IL) development in detail and from its own perspectives, most of those that have considered it as subordinate or accessory to syntactic or structural IL development (Eubank, 1994; Pienemann, 1998; Lardiere, 2000; Haznedar, 2001, 2003). In L2 literature, there are two conflicting research on the development of L2 mor-

phology, if they seem to be more or less subordinate to syntactic development: the Missing Surface Inflection Hypothesis (Lardiere, 2000; Haznedar 2001, 2003) and the Morpheme Processability Hierarchy (Pienemann, 1998, Pienemann & Håkansson, 1999).

The Missing Surface Inflection hypothesis, as its name suggests, is that L2 grammar contains abstract functional categories and features from the outset of acquisition, but the missing or lack of morphological forms in IL data reflects problems with the mapping of these abstract features onto surface morphology. In his analysis of longitudinal data, Haznedar (2003, p. 30) argued for the Missing Surface Inflection hypothesis in that the absence of inflectional morphology cannot be attributed to a lack of functional projections. Rather, the L2 learner appears to have difficulty in associating certain underlying abstract features with surface forms. And he suggested that there is a discrepancy between the development of the syntactic representations of functional categories and inflectional morphology during the course of L2 acquisition, and hence morphological and syntactic development can be independent of each other. On one of the coin, the Missing Surface Inflection hypothesis provides descriptive adequacy to the development of IL morphology. On the other, the hypothesis would be faced with a difficulty in providing explanatory power to the cause of the missing inflections, to put it simply, in explaining the question why IL learners, possessing abstract functional categories and features in their IL grammar, often omit or miss certain surface morphological forms in their productions.

Pienemann (1998, p. 115) proposed the Morpheme Processability Hierarchy according to which morphological IL development follows an implicational developmental sequence of Lexical-Phrasal-Interphrasal Morphemes depending on the Uniqueness Condition (UC). The UC postulates that the values attributed to a constituent must be compatible with each other, and hence governs feature unification processes in a sentence (the full discussion will be laid out in the next section). In this perspective, the UC plays a cognitive or procedural constraint in morphological IL development. On the UC, Pienemann first constitutes a morphological IL developmental sequence called the Morpheme Processability Hierarchy. Thus, the Hierarchy can provide not only a possible answer as to what grammatical morphemes or features IL learners can process at what relative point in time on the morphological developmental sequence, but also a possible alternative to the cause of the missing or variable inflections

in the Missing Surface Inflection Hypothesis. However, Pienemann's Hierarchy has been constructed so narrowly that if there do exist any differences in the degrees of morphological complexity in unifying or encoding grammatical morphemes or features, it seems to have difficulty in representing such differences on the morphological IL developmental sequence. This limitation leads to the research question: How can Pienemann's Morpheme Processability Hierarchy be extended?

This study will propose a unificational mechanism (UM) by intertwining the UC with X-bar formats of the Minimalist program (Chomsky, 1992). The UM can play a kind of cognitive or psychological constraint in morphological IL development, and hence determine the implicational syntactic domains or scopes on which the UC operates. Also, according to the UM, this study will propose Morphological Developmental Sequence (MDS) derived from Pienemann's Morpheme Processability Hierarchy. Finally, this study will show that each stage of the MDS can be explained based either on the IL data from sequence-based SLA research (Pienemann & Johnston, 1987; Pienemann, 1998), or on the utterances IL learners produce.

2. Pienemann's Morpheme Processability Hierarchy

In this section, the Morpheme Processability Hierarchy of the Processability Theory (Pienemann, 1998) will be examined, which is the theoretical basis of the MDS.

2.1. Processability Theory

Pienemann (1998) proposed the Processability Theory which associates Incremental Procedural Grammar (IPG) (Kempen & Hoenkamp, 1987) and the Levelt Model (Levelt, 1989) with Lexical Functional Grammar (LFG) (Kaplan & Bresnan, 1982).¹⁾ By utilizing IPG which involves a time-con-

1) LFG belongs to a family of unificational grammar, the most prominent characteristic of which is the unification of features. To put it simply, the process of feature unification ensures that the different parts that constitute a sentence actually fit together. LFG consists of three components: (a) a constituent structure (c-structures) component which generate surface structure constituents and c-structure relationships, (b) a lexicon, whose entries contain syntactic and other information relevant to the production of a sentence, and (c) a functional component which compiles for every sentence all the grammatical information

strained set of mechanisms for the translation of conceptualizations into lexico-grammatical forms, he postulated the Processability Hierarchy which constitutes an implicational scale of a set of processing procedures in which the processing procedure of each lower level is a necessary prerequisite for the functioning of the higher level as seen in Table 1. The hierarchy, in turn, can predict and describe the sequence of both syntactic and morphological IL developments of a target language, by implementing this universal processability hierarchy into an LFG-based description of the target language.

Table 1. Processability Hierarchy for ESL

Level	Processing Procedures	Unification Constraints	Critical Features	Critical Structures
6	Subordinate cl-Pro.	Interphrasal	[ROOT]	Cancel-Inversion
5	S-Pro./-saliency	Interphrasal	[SENT MOOD]	Aux/Do 2nd, SV agreement
4	S-Pro./+saliency	Interphrasal	[SENT MOOD]	Y/N-Inversion
3	Phrasal-Pro.	Phrasal	[Aux]	Adv/Do/Wh-Front, Neg+V
2	Category-Pro.	Lexical	[Past]	canonical order, plural agreement
1	Lemma	'words'	-	single constituent

As seen in Table 1, Pienemann (1998) constructed the Processability Hierarchy of ESL (English as a second language) by drawing on LFG-based descriptions such as c-structure rules and control equations proposed by Pinker (1984). And he empirically tested and supported the Hierarchy by analysing the longitudinal data from Johnston's adult ESL study (1985) and Pienemann and Mackey's child ESL study (1993).

In sum, the Processability Theory first accounts for IL developmental processes in a unified and principled way by integrating two domains, that is, the universal hierarchy of the processing procedures (i.e., cognitive systems) and the linguistic systems of LFG, and hence provides a reasonable explanation for what has come to be known as developmental problems (Flex, 1984): Why and how does the IL development

needed to interpret the sentence semantically. The interaction of these three components is subject to a set of well-formedness conditions, which are basically very general rules constraining the process of feature unification, ensuring that all the properties of an f-structure are compatible with each other (Pienemann, 1998, pp. 93-95).

change from stage X to stage X+n?

2.2. Feature Unification and the Uniqueness Condition

Before examining the Morpheme Processability Hierarchy, let's take a brief look at the process of feature unification, a core characteristic of LFG, which can be considered as playing a crucial role in the construction of the Processability Hierarchy. The process of feature unification is the one that for each constituent of a sentence to be grammatically acceptable, each value of the grammatical features both within a constituent and between constituents has to be matched. Consider the following sentence.

(1) John has *a toy*.

In the noun phrase (NP) *a toy* in (1), lexical entries *a* and *toy* are both annotated with the feature NUM (number), and in both cases this feature has the value *singular*. For the NP to be grammatical, the values of two constituents have to be matched. This matching process is called *feature unification*. And this unification is governed by the UC, which postulates that feature values attributed to a constituent must be compatible with each other. Let's examine the following example (2).

(2) *John has *a toys*.

In (2a), the lexical specifications of two constituents of the NP *a toys* are in conflict, *a* specifies *singular* for the feature NUM while *toys* specifies *plural*. Obviously, an NP cannot be both singular and plural. Hence, the UC filters out any ungrammatical sentences which have any conflicting features as in (2).

In fact, from the perspective of target language, many IL forms produced by IL learners may violate the UC, but from the perspective of learner language, it may be possible that only the determiner or only the noun or neither of the two is annotated for NUM as in the NP *a toys* of (2). In language acquisition, according to Pienemann (1998), new lexical items are often integrated into the lexicon as a unitary morpho-phonological form, and only later are they broken down into their constituent units. If lexical entries are not annotated for certain features,

the UC logically does not apply to the constituent containing that lexical item. From this perspective, it can be argued that the UC governs the process of feature unification which involves the grammatical encoding of semantic features or relations, and therefore the UC is a prerequisite for grammatical encoding. Thus, conversely, the acquisition process of grammatical encoding is the process of application of the UC into various linguistic contexts.

2.3. The Morpheme Processability Hierarchy

On the basis of the UC and the hierarchy of processing procedures, Pienemann (1998) has proposed the Morpheme Processability Hierarchy which follows an implicational developmental sequence of Lexical-Phrasal-Interphrasal Morphemes. Lexical Morphemes rely on diacritic features which are contained in the lexical entry, and for this lexical affixation, the Category procedure is called. Phrasal Morphemes require the unification of diacritic features in the head of a phrase and the modifier, and for this phrasal unification, the Phrasal procedure is needed. Interphrasal Morphemes rely on the unification of diacritic features between phrases, and for this interphrasal unification, the Sentence procedure is called. In the following section, the Hierarchy will be examined in detail.

2.3.1. Lexical Morphemes

According to Pienemann, Lexical Morphemes rely on diacritic features which are contained in the lexical entry of words. The grammatical information relating to the morphological tense marker *past-ed*, for example, is part of the lexical entry of the verb. The unification of diacritic features and the exchanges of grammatical information do not take place at all either within a phrase or between phrases. Tense, possessive, and number are called lexical morphemes because they are directly inserted from the (conceptual) lexical entry.

2.3.2. Phrasal Morphemes

Phrasal Morphemes require the unification of diacritic features in the head of a phrase and the modifier within a phrase. In Phrasal Morphemes, grammatical information needs to be exchanged between constituents within a phrase. Thus, phrasal agreements such as plural agreement are

included in this type of morpheme. For instance, the relevant lexical entries for the NP *many dogs* are as follows:

- plural [many dogs]_{NP}
 pl pl
- many: DET, (SPEC) = MANY
 (NUM) = PL
- dogs: N, (PRED) = DOG
 (NUM) = PL

As illustrated above, to achieve plural agreement, the value for the diacritic feature NUM has to be unified between Det and N. Pienemann (1998) calls this type of affixation *phrasal*, because it occurs within a phrase.

2.3.3. Interphrasal Morphemes

Interphrasal Morphemes rely on the unification of diacritic features and exchanges of grammatical information between phrases. Thus, SV agreement (3sg-s) involves the matching of features in two major constituents, namely NP_{subj}, and VP. The insertion of the 3rd person singular-s for SV agreement marking requires the following syntactic information:

- S-V affix TENSE = present
 SUBJ NUM = sg
 SUBJ PERS = 3
- [This man]_{NPsubj} [{owns}_v···]_{VP} (Present, imperfective)
 PERSON = 3 PERSON = 3
 NUM = SG NUM = SG

As illustrated above, the values for the features NUM and PERSON must be compatible with the functional structure of Subject and the lexical entry of Verb. Pienemann (1998) terms this type of morphological process *interphrasal affixation*.

3. Morphological Developmental Sequence on the Unificational Mechanism

As discussed so far, the UC governs the process of feature unification, and hence is a prerequisite for grammatical encoding. Thus, the UC can act as a cognitive or a procedural mechanism in morphological IL development. In sum, Pienemann's Morpheme Processability Hierarchy can be represented as shown in (3).

- (3) Lexical Morphemes → Phrasal Morphemes → Interphrasal Morphemes

According to Pienemann (1998), the Hierarchy in (3) forms an implicational scale in which Lexical Morphemes are acquired prior to Phrasal Morphemes, and Phrasal Morphemes prior to Interphrasal Morphemes. In this respect, Pienemann first determines a morphological developmental sequence according to the UC. The Hierarchy can thus provide a reasonable explanation as to which grammatical morphemes or features IL learners can process or encode at what stage on the Morpheme Processability Hierarchy.

However, with all its contributions to SLA, Pienemann's Hierarchy is constructed so sparsely that it seems to have difficulty in explaining the IL developmental processes of the Interphrasal Morphemes in (4).

- (4) a. **These boys are a good detective.*
 b. **I demanded that John invited **ed** Mary last Sunday.*

According to Pienemann's explanations, since, in the two NPs of (4a), *These boys* and *a good detective*, each value of the feature [NUM] is unified within each phrase, they belong to Phrasal Morphemes. However, for the sentence to be acceptable, in addition to this phrasal affixation, feature unification has to take place again across the phrasal boundaries, and hence this is considered to be interphrasal affixation rather than phrasal. In the embedded clause of (4b), the occurrence of feature unification between *past-ed* and *last Sunday* would result in a grammatical sentence, but this leads to ungrammaticality as seen in (4b) because of a mismatch between the features [Subjunctive], the matrix and the embedded clause. Thus, by Pienemann's definition, both examples of (4) be-

long to Interphrasal Morphemes on the Hierarchy in (3) since feature unification takes place between the phrases. This implies that both examples are at the same developmental stage, thereby assuming that their morphological complexity will also be same. However, there will be some differences in the morphological complexity of these morphemes, depending on what linguistic context the UC is applied to, for example, VP, or IP, or CP adopting Minimalist terminology. Thus, these differences should also be represented on the IL developmental sequence of morphological systems.

This limitation leads us to the research questions: How can we formalize the syntactic scopes to which the UC applies?, and hence how can we extend Pienemann's Morpheme Processability Hierarchy?

For the question as to how to formalize the syntactic scopes, this study proposes a Unificational Mechanism (UM), which is derived from intertwining the UC with the X-bar formats of the Minimalist program (Chomsky, 1992) as shown in Figure 1.

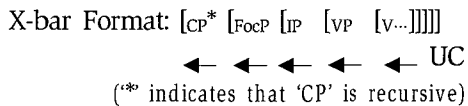


Figure 1. Unificational Mechanism (UM).

Figure 1 illustrates that the X-bar formats consist of V, VP, IP, FocP, and CP* in terms of X-bar theory (Haegeman & Guéron, 1999), and thus the developmental sequence of the syntactic systems constitutes an implicational scale according to the logic of the Minimal Three Approach (Vainikka & Young-Scholten, 1996, 1998). In addition, on each stage of the syntactic sequence, each relevant syntactic mechanism operates successively from the lowest local or minimal domain up to the highest local or minimal domain of the X-bar formats, and thus this also constitutes an implicational scale²⁾ according to the logic of the Locality

2) That is, the lexical-inserting mechanism operates on the [V] domain, the theta-assigning mechanism operates on the [VP] domain, the case-marking mechanism on the [IP] domain, the force-realizing mechanism on the [FocP] domain, and the force-matching mechanism on the [CP*] domain, and hence each syntactic mechanism operating on each local or minimal domain constitutes an implicational scale (Kim & Kwon, 2005).

Condition.³⁾ Therefore, by extrapolating from the syntactic developmental sequence to the UC, the syntactic domains or scopes of the operation of the UC also constitute an implicational scale. From this, the implicational sequence of the application of the UC can be formalized as V-VP-IP-FocP-CP*.

Consequently, by synchronizing the UC with the syntactic developmental sequence, the UM not only governs the unification processes of grammatical features or morphemes in real time (plays the role of the UC), but also determines the implicational syntactic domains or scopes on which the UC operates, or in which feature unification takes place. Thus, the UM can represent the degrees of morphological complexity in unifying or encoding grammatical morphemes or features on the morphological IL developmental sequence. Therefore, this study proposes a revised Morpheme Processability Hierarchy called the Morphological (Unificational) Developmental Sequence (MDS) according to the UM as shown in (5).

(5) Morphological Developmental Sequence (MDS) on the UM:

Lexical_[v...] → Phrasal_[VP...] → Clausal_[IP...] → Sentential_[FocP...] → Intersentential_[CP*...] Stage

The MDS in (5) is on the assumption that morphology interacts with syntax, and thus morphological IL development is implicationally contingent on syntactic IL development. It is consistent with epidemiological logic that only when IL learners are able to produce or process a certain syntactic structure, are they able to unify or match grammatical features or morphemes within the structure.

Let's examine each stage of the MDS in (5) in terms of the UM. The Lexical Stage involves the insertion of grammatical morphemes or features directly from the lexical entry without the operation of the UC or any exchange of grammatical information between any of the constituents in a sentence (corresponding to Pienemann's lexical morphemes). The Phrasal Stage involves the operation of the UC within the

3) The locality constraint[condition] on grammatical relations restricts possible syntactic relations: it allows a constituent A to enter into a grammatical relation with a constituent B provided A bears a local relation to B. Thus, locality has impact on selection, on theta-role assignment, on case-assignment, and on movement (Haegeman & Guéron, 1999).

domain of the [_{VP...}] in which feature unification or exchanges of grammatical information take place (corresponding to Pienemann's phrasal morphemes). The Clausal Stage relates to the operation of the UC within the domain of the [_{IP...}], where each grammatical morpheme or feature is unified compatibly (corresponding to Pienemann's interphrasal morphemes). The Sentential Stage involves the application of the UC within the domain of the [_{FocP...}], in which feature unification or exchanges of grammatical information take place. Finally, at the Intersentential Stage, the UC operates across the domains of [_{CP...}], and hence feature unification or exchanges of grammatical information take place between the matrix and the embedded clauses. It follows that morphological IL development goes hand in hand with syntactic IL development. Now, based on the UM as discussed so far, a developmental stage can be assigned to each of the interphrasal morphemes of (4) as follows: (4a) belong to the Clausal Stage, and (4b) to the Intersentential Stage, respectively.

4. Morphological Developmental Stages

In this section, each stage of the MDS will be laid out based either on the IL data from sequence-based SLA research (Pienemann & Johnston, 1987; Pienemann, 1998), or on the utterances IL learners produce, and then the sources of the non-synchronizations of the MDS will be discussed.

4.1. Morphological Developmental Stages

4.1.1. Lexical Unificational Stage

The Lexical Stage involves the one-to-one mapping of IL learners' conceptual or mental structures onto the argument structures of predicates, resulting in canonical structures, relying on serial NVN strategies (Bever, 1970). Since IL learner aren't able to operate the UC, thereby no feature unification or exchanges of grammatical information occurring between grammatical morphemes or features in the canonical structures, they will produce ungrammatical sentences like (6).

- (6) a. *I have *two toy*.
 b. *I go *yesterday*.

In (6a), they aren't able to match the [\pm Singular] feature within the NP *two toy*, and similarly, in (6b), they aren't able to unify the [Tense] feature within the VP *go yesterday*.

4.1.2. Phrasal Unificational Stage

At the Phrasal Stage, the UC operates within a VP ($[_{VP}\dots]$), in which feature unification takes place between each lexical head (i.e., V, N, A, P) and its complement such as plural agreement. Consider the following example and its analysis in (7).

- (7) a. *I *have wrote* two books.
 b. * $[_{IP} I [_{I} \textit{have} [_{VP} \textit{wrote} \textit{two books}]]]$.

As seen in the analysis (7), IL learners can unify [\pm Singular] features within the VP to match plural agreement as in *two books*. However, since they aren't able to apply the UC into the IP, they haven't yet matched tense agreement between the constituents within and without the VP, that is, between *wrote* and *have* (i.e., I) as in *have wrote*.

4.1.3. Clausal Unificational Stage

At the Clausal Stage, the UC operates within an IP ($[_{IP}\dots]$), where feature unification takes place between the head I and its complement (a VP) in accordance with the operation of the case marking mechanism such as [\pm Finite] unification between the head I and its complement, tense agreement between [Tense] features, and SV agreement between [AGR] features. Let's examine the following (8).

- (8) a. I want *to go* there.
 b. I *have written* two books.
 c. *He owns* many dogs.

In (8), IL learners can match [\pm Finite] features in (8a), unify the Verb and [Tense] features in (8b), and match Subject *He* and [AGR] features in (8c).

4.1.4. Sentential Unificational Stage

At the Sentential Stage, the UC operates within a FocP ($[_{FocP} \dots]$), in which feature unification takes place between the force features [\pm Force] in accordance with the operation of the force-realization mechanism. To put it simply, since IL learners can apply the UC into a FocP, they can match unmarked forces [-Force] such as declarative force or topical force with the [-SAI]/[-WH] feature, and also unify marked forces [+Force] such as focal force or interrogative force with the [+SAI]/[+WH] feature (SAI=Subject Auxiliary Inversion, WH=*wh*-words). Consider the following in (9).

- (9) a. Whom will you invite?
 b. On no account will I go there.
 c. *Where *you have* been?
 d. *Who *do you met* yesterday?

In the case of (9a), (9b), focal force ([+Force]) unifies [+SAI] feature, thus satisfying the UC and rendering the sentences grammatical, but in (9c), (9d), focal force ([+Force]) misunifies [-SAI] feature, thereby violating the UC and leading to ungrammaticality.

4.1.5. Intersentential Unificational Stage

At the Intersentential Stage, the scopes or domains of the applications of the UC is across CPs ($[_{CP} \dots]$), in which force unification or force constraints are involved in the operation of the force-matching mechanism. Let's examine the following in (10).

- (10) a. I hope *that Mary will dance after lunch*.
 b. *I wonder *whether will you invite* Mary at the party.
 c. *He *said that he has read* the novel.
 d. *I *demanded that John invited* Mary *last sunday*.

In (10a), since the matrix verb *hope* has the [-SAI]/[-Wh] feature and the complementizer *that* has the [-SAI]/[-Wh] feature, they unify each other and hence satisfy the UC. However, in (10b), [+SAI] feature in the root question has to be changed into [-SAI] in the embedded clause, that is, inversion has to be *anceled* within the embedded clause, but it is kept intact, thereby violating the UC and rendering the sentence ungrammatical.

Similarly, in (10c) the [Tense] features are mismatched, and in (10d) the [+Subjunctive] features are mismatched between the CPs (i.e., between the matrix and the embedded clause), thereby resulting in ungrammaticality.

4.2. Summary of Morphological Developmental Stages

To sum up, the UM derived from the extrapolation of the UC to the syntactic developmental sequence captures the relative morphological complexity involved in unifying or encoding grammatical morphemes or features. In this respect, the UM functions as a sorting mechanism for sequentializing the MDS as well as predicting the scopes of unification and critical unifications on each stage of the MDS as illustrated in Table 2.

Table 2. Morphological Developmental Sequence on the UM

Morphological Stages	Morphological Sequence		Critical Unifications
	Scopes of the UC	Feature Unification	
Lexical	[N],[V],[N]	No unification	-
Phrasal	[_{VP} [V.....]]	Unification within a VP	Plural agreements
Clausal	[_{IP} [_{VP}]]	Unification within an IP	Tense/SV-agreements
Sentential	[_{FocP(-CP)} [_{IP}]]	Unification within a CP	Force-agreements
Intersentential	[_{CP} ...[_{FocP(-CP)} ...]]	Unification across CPs	Tense-agreements, Force/Modality-agreements

Therefore, the MDS can go beyond the limitations of Morpheme Processability Hierarchy (Pienemann, 1998) to explaining the interactional processes of morphological development with syntactic development more systematically by incorporating cognitive mechanisms (i.e., the UC) and linguistic mechanisms (i.e., the LC) according to the Modular Approach (Ellis, 1994; Gregg, 1996; Pienemann, 1998).

The MDS is on the assumption that morphology interacts with syntax, and hence morphological IL development is synchronized with syntactic IL development. As seen in Table 2, the syntactic sequence of V-VP-IP-FocP-CP* is hierarchical and forms an implicational scale according to the logic of X-bar theory. And in turn, the syntactic scopes (domains) of the operations of the UC, which are intertwined with the X-bar formats, also constitute an implicational scale (i.e., the UM). Thus, the MDS constitutes an implicational relation in which each higher stage on the MDS

can include the morphological mechanisms and the critical unifications of the lower stages, but not the reverse, which means that each stage of the MDS is a necessary prerequisite for the following one.

What this implicational relation implies is that no morphological stage on the MDS can be *skipped* and *beaten*, and therefore, it is not until IL learners can *unify* the grammatical morphemes or features imposed on each stage of the MDS that they can proceed from one stage to the subsequent, just as a caterpillar goes through the ordained shedding process step by step and finally becomes a butterfly. Therefore, the MDS can provide a theoretical basis for explaining the sources of deviating certain morphological forms in IL development from the ideal MDS.

4.3. The Sources of Non-synchronizations on the MDS

Haznedar (2001, 2003) reported from the longitudinal IL data that CP-related elements such as I-to-C movement involved in Y/N-questions and *wh*-questions have been acquired prior to the productive use of IP-related elements such as tense and agreement morphemes (past-*ed*, 3sg-*s*). Based on these findings, Haznedar argued against the Minimal Tree Approach according to which the acquisition of functional categories follows an implicational sequence of development of VP-IP-CP (Vainikka & Young-Scholten, 1996, 1998), and argued for the Missing Surface Inflection hypothesis according to which the absence of inflectional morphology (e.g., past-*ed*, 3sg-*s*) in IL grammar is not attributed to a lack of functional projections or any underlying syntactic deficit, but rather to problems in associating certain underlying abstract features with surface forms (Haznedar, 2001, 2003). Thus, he suggests that there is a discrepancy between the development of syntax and that of morphology, and hence morphological development and syntactic development can be independent from each other. Seemingly, the Missing Surface Inflection hypothesis provides descriptive adequacy for the development of IL morphology. In reality, it can also be argued that the Hypothesis has difficulty in providing explanatory power for the sources of the missing inflections, more specifically, for the questions of why certain morphological forms deviate from the ideal MDS and what causes non-synchronization of morphological IL development with syntactic IL development.

One of the sources of non-synchronization can be found in the charac-

teristics of IL rules. Generally, IL rules can be distinguished from *sudden rules* and *gradual rules* according to the manner of acquisition, and also from *simple rules* and *complex rules* in terms of the process of acquisition.

Sudden rules, as its name suggests, are the ones that the moment IL learners acquire the mechanisms for realizing the rule in question, they will “*suddenly*” (over a relatively short period of time) reach error-free acquisition. These rules are generally syntactic-driven like I-to-C movement associated with Y/N-questions. On the other hand, *gradual rules* are the ones that even after IL learners acquire the necessary mechanism, they will only “*gradually*” (over a relatively long period of time) progress to error-free acquisition. These rules are generally lexical-driven like the gender system of German or the tense system of English. Thus, sudden rules such as I-to-C movement tend to coincide the emergence stage of the rule with the completion stage on the developmental sequence, whereas gradual rules such as past-*ed* tend to leave time gaps between the emergence stage and the completion stage, as attested by the results of Haznedar (2003, pp. 25-29). Therefore, the former will be less likely to cause a non-synchronization of syntactic IL development with morphological IL development, whereas the latter will be more likely to bring about distortions on the MDS.

From the perspectives of psycholinguistics, *simple rules* will need relatively “*simple*” cognitive or processing operations for the realization of the rule in question. These rules are generally completed with a single operation like *adv/wh*-frontings. On the other hand, *complex rules* will require relatively “*complex*” cognitive or processing operations. These rules are generally realized through more than two operations like *wh*-questions, indirect-questions, and relatives. Thus, the simple rules realized with a single manipulation are less likely to be retarded on the sequence, and hence do not distort the MDS, whereas the complex rules realized through several operations are more likely to be retarded, and hence they do distort the MDS, as attested by the results of the longitudinal data of Haznedar (2003, pp. 17-18). Therefore, the simple rules will be less sensitive to the Teachability Hypothesis (Pienemann, 1984), whereas the complex rules will be more sensitive to the Hypothesis. Thus, unless complex rules conform to it, IL learners will be liable to rely on an *interim* structure of the rule in question such as *wh*-fronting in processing *wh*-questions, and this brings about fossilization of the

structure.

Another source of the distortions may be found in IL learner's socio-affective factors. As pointed out by Larsen-Freeman and Long (1991), according to the Multidimensional Model (Meisel, Clahsen & Pienemann 1981), standard-oriented learners, preferring accuracy, tend to elaborate IL rules. Supposedly, they will have a tendency to pass from one stage to the next on the MDS in a stepwise fashion through the synchronization of syntactic development and morphological development. On the other hand, simplifying learners, favouring communicative effectiveness, tend to simplify the rules, and hence will have a tendency to skip or beat the stages on the MDS. However, further research needs to be done in order to explain the relationships between the characteristics of IL rules and the socio-affective factors of IL learners with the non-synchronizations of the MDS.

5. Conclusions and Implications

The discussion so far leads us to the questions raised in the introduction: What mechanism operates on the development of L2 morphology? And How can Pienemann's Morpheme Processability Hierarchy be extended?

In sum, the UM derived from the extrapolation of the UC to the syntactic developmental sequence, captures the relative morphological complexity involved in unifying or encoding grammatical morphemes or features. In this respect, the UM functions as a sorting mechanism for sequentializing the MDS as well as predicting the scopes of unification and critical unifications on each stage of the MDS. Thus, going beyond the problems of Pienemann's Morpheme Processability Hierarchy, the MDS can explain the interactional processes of morphological IL development with syntactic IL development more systematically by incorporating cognitive mechanisms and linguistic mechanisms.

Therefore, this study gives a possible answer to questions as to why IL learners deviate from the ideal MDS. From the psychological perspective, IL learners, for some reason or other, are not able to apply the UM to the corresponding syntactic structures imposed on each stage of the MDS, this resulting in missing or omitting surface morphological forms. And this, in turn, brings about non-synchronizations of morphological

development with syntactic development, and causes distortions on the MDS. As discussed above, one source of non-synchronization may be found in the characteristics of the IL rules (sudden and gradual rules, simple and complex rules). Another may be responsible for the socio-affective orientations of IL learners (standard-oriented and simplifying learner) according to the Multidimensional Model.

In addition to the theoretical implications, there may be a practical implication. As discussed already, from each stage of the MDS being in an implicational relation, a motivating principle of language pedagogy, what Pienemann calls *Teachability Principles* (Pienemann, 1984, 1998), can be derived, which implies that any instruction will be beneficial if it focuses on grammatical morphemes or features of the subsequent stage of IL learners' current stage on the MDS. Thus, the MDS could provide an alternative answer to the principal questions raised in recent research on Form-focused Instruction: When and how to provide which morphemes or features for IL learners? (Lightbown & Spada, 1990; Doughty, 1991; Robinson, 1996; Doughty & Williams, 1998).

With all such implications for SLA, the UM and the MDS have trouble in explaining the IL developmental processes of structural systems (i.e., word-order rules). To overcome this problem, the MDS on the UM should be complemented by Procedural Developmental Sequence on Speech Processing Mechanisms as in studies of Kim and Kwon (2005, 2006) according to the Modular Approach (Ellis, 1994; Gregg, 1996; Pienemann, 1998).

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