
Acquisition of Agreement Structures by Ghanaian Arabic Learners: A Processability Theory Study

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ABSTRACT:

The study investigated acquisition of agreement structures by Arabic as Foreign Language (AFL) learners in Ghana from the Processability Theory (PT) perspective. Five Arabic agreement structures at the phrasal, sentence and subordinate clause levels of PT's processing procedures were tested in a cross-sectional study. It aimed to establish predictions about the implicational nature of the processing procedures. Data were elicited from 15 students of the University of Ghana Arabic learners who were at different proficiency levels. Grammaticality Judgment Task and Elicited Production Task were used to elicit data. The result suggested that acquisition of agreement structures by Ghanaian AFL learners develop, generally, according to PT's predictions. While the study largely conforms to PT predictions, the behaviour of the Noun Predicative Adjective structure in the interlanguage system of participants suggests that factors other than processing constraints may be involved in the processing architecture of the L2 learners in Ghana.

Keywords: AFL learners, agreement structures, developmental trajectories, interlanguage, morphosyntax, Processability Theory.

Acquisition of Agreement Structures by Ghanaian Arabic Learners A Processability Theory Study**1. Introduction**

The ability to explain the developmental trajectories of the interlanguage (IL) competence of second language learners constitutes one of the major goals of Second Language Acquisition (SLA) research. Lakshmanan & Selinker (2001) maintained that SLA studies explain, among other things, how IL develops overtime from initial state to an end state (p. 393). More importantly, SLA research since its inception has mainly focused on providing empirical evidence on how

the grammatical systems of the L2 learner are developed (Pienemann, 2015).

Besides, the acquisition of morphosyntactic agreement structures is vital in the interlanguage development of second language (L2) learners because of the important role they play in conveying meaning of linguistic structures (Boeckx, 2006). Its acquisition is even more crucial considering that Arabic agreement rules are more complex than those found in other languages, such as French and Spanish (Habash, 2010; Holes, 2004 as cited in Alkuhlani & Habash, 2011). Although, agreement structures constitute some of the mostly researched areas in SLA, its acquisition is one of the challenges faced by second language learners (Gass, & Mohamed, 2017; Azaz, 2018).

Several frameworks exist, within the cognitivist approaches to SLA, to explain the mental processes involved in L2 acquisition and how L2 production is attained. Those frameworks can be classified under two groups, namely processing approaches and the constructionist approaches (Mitchell & Myles, 2004). The present study falls within the processing approaches framework which seeks to describe the ways and means of storing and accessing rules that are embedded within structures of a language (Braid 1999). Typical processing approaches include VanPattern's (1996) Input Processing Model, the Multidimensional Model (Meisel, Clahsen and Pienemann, 1981) and the Processability Theory (Pienemann, 1998a).

The present study proposes to use the Processability Theory (PT) framework formulated in Pienemann (1998a, 2005) to study the production of morphosyntactic agreement structures by Arabic as Foreign Language (AFL) learners in Ghana. The choice of PT as a framework for the present study was guided by the fact that it addresses issues of learners' language development as well as its application, which are crucial for both theoretical and pedagogical considerations (Baten, 2011). Unlike other SLA perspectives, this theory is comprehensive as it addresses the processes of IL development and makes prediction across languages.

1.1. Processability Theory

Processability Theory is a psycholinguistic theory that describes development of L2 grammatical structures across languages irrespective of L1 (Pienemann, 2011). PT as a theory of development of L2 grammatical structures sees language development as "the acquisition of procedural skills needed for the processing of the language" (Pienemann, 2005, p. 198). Pienemann maintains that so long as the order in which language develops in learner is spelled out, structural outcomes associated with each level of development can equally be outlined. Thus, PT predicts structures which can be

processed by the learner at a given level of development. However, for those structural forms to be processed, the learner needs to have the required processing resources for the structures in question. This is especially important because the L2 learner is constrained by the architecture of language processing of which part of it is the procedural skills. The theory predicts, among other things, that the learner would produce only linguistic structures he/she can understand and that which can be handled by the state of his/her language processor. PT makes predictions about language production from speech and (later) writing. The question of comprehension is still being explored.

Pienemann (1998a) devised a hierarchy of processing procedures for the acquisition of syntax and morphology as in Table 1. The hierarchy is implicational such that each preceding procedure is a prerequisite for the next procedure. The procedures “cannot be skipped even through formal instruction” (Pienemann, 1998a, p. 250). This implies that AFL learners would have to acquire agreement structures in a predictable order.

Nielson, (1997) in her study of the acquisition of Arabic agreement structures maintains that conclusion made by the PT theory regarding the hierarchy of processing procedures holds true. She established that learners would be able to acquire agreement structures at the $x+2$ (local morphology) level before the $x+3$ (non-local morphology) level. While exchange of information is within a constituent in local morphology, it is between constituents at the $x+3$ level. (See Table 2).

Table 1 *Implicational Hierarchy of Processing Procedures*
(Pienemann, 1998a)

Levels	Processing procedures	Developmental Stages				
		t1	t2	t3	t4	t5
5	subordinate clause procedure	-	-	-	-	+
4	S-procedure (S: subject)	-	-	-	+	+
3	phrasal procedures	-	-	+	+	+
2	category procedures	-	+	+	+	+
1	Word/lemma access	+	+	+	+	+

Note. t = time, (+) = structure has emerged, (-) structure has not emerged. Source: Pienemann (1998a, p. 8).

The theory can be applied to various languages, including Arabic. Although the hierarchy of processing procedures is predicted to be the same as in other languages, the linguistic realisation will be different. Pienemann (1998a) explained that to avoid misapplication of the theory, the processability hierarchy has to be applied to a new

target language based on the Lexical-Functional Grammar (LFG) that was adopted by Pienemann to explain grammatical information exchange between constituent structures. The LFG is a theory of grammar that depends on grammatical information exchange (agreement marking) to ensure that different constituents of a sentence or phrase can be unified together in terms of their grammatical features, like NUMBER, PERSON, TENSE, etc. (Pienemann, 1998a).

Drawing on the LFG framework, Alhawary (2003), Mansouri (2001; 2005) and others examined Arabic syntactic and morphological structures and have come out with Arabic hierarchy of processing procedures (which this study relied upon) as shown in Table 2.

1.2. Arabic PT Empirical Studies

Mansouri (2000) investigated the processing of Arabic morphosyntactic structures by Arabic as L2 learners; and he also examined whether that would follow the same developmental sequences reported in Pienemann (1998a). He elicited two oral data samples from four native speakers of English in a quasi-longitudinal study that extended for over one academic year. Mansouri's findings pointed to similarities in syntactic structures between Arabic developmental procedures and those predicted by PT. However, the acquisition of Arabic morphological features showed "violations to the predicted developmental sequences" (Mansouri 2000: 167). In other words, there was a case of intra-stage skipping. Mansouri maintains that the validity of PT as a universal predictive framework should not be called into question because processing mechanisms for morphological and syntactic properties are not the same typologically-different languages. However, Mansouri (2005) which depended on Mansouri (2000) previous findings provided more clarification to the effect that explanatory tools, including language-specific typological features like form-function relationships and classificatory information "can be used to account for intra-stage developmental order" (p. 150).

The theory, though, allows for variations among learners within the same developmental stage. In fact, Pienemann (1998a, p. 250) referred to those variations as "developmental trailers" and that the fact that the learner has reached a stage is not a prediction that all structures within that stage have to emerge in tandem. Braidı (1999) also puts it succinctly that learner orientation towards the target language also accounts for this variability. In essence, variations that are not of developmental trajectories type do not invalidate PT universal claims.

In Alhawary (2003), data from nine American English speakers of Arabic as an L2 was collected in a longitudinal study. The target structures for the study were noun-adjective (N-A) and subject-verb

(S-V) agreement predicted to be processable at stage three (phrasal procedure) and four (S-procedure) respectively. Alhawary (2003) adopted evidence of acquisition criterion that stipulates that 90% of obligatory context produced by participants must be correct in order to be judged as acquired.

Table 2 *Processing Hierarchy of Arabic Morphosyntactic Agreement Structures*

Stage	Processing Procedures	Information Exchange	Arabic Morphosyntax Structures
5	Subordinate clause procedure	Inter-clausal (or distinction between main and subordinate clauses)	<ul style="list-style-type: none"> • Relativisation (Embedded Adjectival Clause [AdjCls]) • an + verbal complement (Vcomp) • embedded ?anna + clausal complement(EmbdCls)
4	S-procedure (S=subject)	Interphrasal (exchange of info. between constituents and from internal to salient constituent)	<ul style="list-style-type: none"> • VS(O) agreement • SV(O) • N + Predicative Adj.
3	Phrasal procedure	Phrasal (exchange of info. within constituents)	<ul style="list-style-type: none"> • Dem-al-N • N-Adj
2	Category procedure	Lexical (no info. exchange)	<ul style="list-style-type: none"> • N-t (semantic gender) • V-affix
1	Words/ lemma	none	<ul style="list-style-type: none"> • undifferentiated words

Source: Adapted from Mansouri, 2005; Alhawary, 2009; Al Shatter, 2011

Alhawary (2003) concluded that his Arabic data does not support the processing stages of PT hierarchy because, contrary to PT processing constraint, the S-V agreement emerged earlier than N-A agreement among six out of the nine participants. Alhawary speculated among other things that while PT's underlying rationale

may be valid, its provision for processing procedures may not. For this, he suggested that other processing factors like L1 transfer has to be factored in when accounting for the processing of grammatical morphemes.

Apart from the fact the 90% threshold is at the high end of an accuracy scale, Alhawary seems to compare emergence to acquisition which is in contrast with the fundamental claims of PT that looks at acquisition as a process. Actually, the theory is rather concerned with the first systematic use of a particular structure. As Nielson (1997: 58) notes, PT approach makes sense, because “acquisition is not a punctual phenomenon, but rather one characterized by progression and regression”.

Husseinali (2006) investigated the development of syntax and agreement in the IL of AFL learners using the PT. In all, he studied seven structures that were predicted to be acquired at the stage 3, 4 and 5 stages of the theory. The aim of the study was to find out whether his findings will be consistent with PT’s predictions as well as the developmental sequences in the IL of learners of AFL. Husseinali elicited learner production data from six AFL learners at two different times. Free elicitation questions and picture description were used to collect the data. He applied a two-fold acquisition criterion, that is frequency rate for syntactic structures and frequency and accuracy for agreement combinations. He found among other things that syntactic development followed PT’s prediction in terms of stages. However, there was an instance of inter stage variation where SV was acquired earlier than the VS order, contrary to PT predictions.

Although inter stage variability does not falsify the theory, the choice of two different criteria for the same study is problematic. That is the correct production of four structures was used as the basis for syntactic development, while production of two correct structures at 80 percent accuracy level was set for agreement combination. Besides, the differentiation between acquisition and emergence employed in the study is contrary to the PT framework.

Al Shatter (2011) considered the correlation between classroom instruction and developmental trajectories of Arabic L2 as predicted by the PT framework. Data was collected from nine students learning Arabic as L2 in interview sessions over two teaching semesters. Structures at all stages of the hierarchy were elicited and analysed through distributional analysis and implicational scaling (Al Shatter, 2011, p. 133). Al Shatter reported that the emergence of Arabic L2 structures in the students’ data is in line with the developmental trajectories predicted by the theory.

Research findings in languages other than Arabic have generally validated PT predictions. In the domain of Arabic language,

however, research findings have provided mixed results (see Alhawary, 2003, 2009; Mansouri, 2000, 2005; Nielson, 1997). PT predictions need further testing in the field of AFL learning, using different participants from different environment which hitherto has not been tested, as in the present study, so that PT's claim of typological plausibility is further verified.

Given that Arabic studies thus have produced mixed results for PT predictions, it is the aim of the present study to further test the cross-linguistic plausibility of PT using Arabic learners in an environment different from what has been studied so far. This study therefore seeks to answer the following research questions: first, what is the developmental trajectories for Arabic morphosyntactic agreement structures among AFL learners in Ghana? Second, would the agreement structures being investigated emerge as predicted by the Processability Theory? Finally, does result for the present study provides evidence that factors other than processing constraints are involved in the acquisition of Arabic agreement structures?

2. Materials and Methods

2.1. Participants

The participants for this study were 15 Ghanaian students (10 females, 5 males), all studying Arabic as a foreign language, in addition to other courses like English, Economics, Psychology, etc. at the University of Ghana, Legon. They have all spoken English since the start of their education. Ghana is a multilingual country with English as its official language. The current language policy however allows for the use of both the local language and English as languages of instruction at the lower primary level (Anyidoho, 2018). Other cross-sectional studies that tested the PT, like Di Biase and Kawaguchi (2002) used participants between six and nine in testing the plausibility of PT in Italian and Japanese languages, respectively.

Participants were enrolled in second-year (Group 1; $N = 5$), third-year (Group 2; $N = 5$) or fourth-year (Group 3; $N = 5$) courses at the University. No visiting Arabic students were included among the participants. The placement was done based on their respective levels in their programme of study.

2.2. Procedure

The study used two types of data eliciting procedures, namely the Grammaticality Judgment Task (GJT) and Elicited Production Task (EPT). GJT aims at measuring participants' *knowledge of ungrammaticality* and their receptive knowledge of Arabic agreement structures (Munnich et al, 1994). Tremblay (2005) posits that GJT is one of the widespread data collection methods for assessing language development among L2 learners. Baten (2011) used the "fill-in-the-

blanks exercises”, which is similar to the GJT as used in this study, to collect data in his cross-sectional study titled “Processability Theory and German Case Acquisition”.

On the other hand, the purpose of the EPTs is to measure participants’ use of the target structures and their performance in those structures. This is a written technique rather than a spoken one as in Mansouri (2005). Ambridge and Rowland (2013) maintain that more control could be exerted in the use of EPT by the use of sentence /stem completion technique, as is the case in this study. Both the GJT and EPT are written production instruments that fit within the PT framework designed to account for learner production, not reception.

In scoring the data, both tasks were amalgamated and subsequently expressed in a percentage ratio to arrive at whether an agreement structure has been acquired or not. Zhang and Lantolf (2015) in their study of the teachability of L2 developmental routes also amalgamated data from different tasks, i.e. imitation task (EI), a question-and-answer session (Q&A), and an oral cartoon description task (CD) (p. 166). Unlike Pienemann’s (2015) claim that Zhang and Lantolf (2015) elicitation tasks tapped into different psycholinguistic mechanisms, the elicitation tasks for the present study do not suffer the same critique, in that they both primarily measure implicit knowledge of grammar knowledge rather than explicit (Spinner, 2013, p. 711).

2.3. Acquisition / Emergence paradigm

An acquisition criterion provides an intelligible framework in L2 research on whether an interlanguage structure has been acquired by the learner or not. However, acquisition has been operationalised in different ways using varied methodologies (Spinner & Jung, 2018).

Whereas some linguists tend to equate acquisition to accuracy, as in the form of 60 percent, 80 percent or 90 percent of cases (Pallotti, 2007), Pienemann maintained that relating acquisition to accuracy levels does not account for the point at which a structure first emerges in the IL system of the learner. Pienemann (1998a) and others (see Bardovi-Harlig, 2000; Meisel et al. 1981) thus call for an emergence criterion that will instead account for the first systematic appearance of a grammatical feature in the learner’s language. More importantly, the emergence criterion is used by the linguist to unravel the structure of the target language (Pienemann, 2015).

Again, an emergence criterion must be formulated and operationalised for the purpose of assessing the point of acquisition of a linguistic structure within the IL development of the L2 learner. Pienemann maintained that the first systematic production of a structure in at least four different contexts marks its emergence.

In operationalising the emergence criterion, Alhawary (2009) considered evidence of emergence of a structure to be the production of a minimum of two tokens of the given structure. However, to qualify as an acquired structure, it should be at an accuracy level of 90 percent. Husseinali (2006) considered a structure to have been acquired if it is produced at least two times with an accuracy rate of 80 percent or more.

The present study adopts an acquisition criterion that is based on the combination of frequency and an accuracy threshold. Thus, a structure is considered acquired if there is a rule application in the production of at least four tokens of any of the target forms as in Pallotti (2007, p. 375), with an accuracy level of 50 percent or more. The accuracy level was to account for the systematic use of target forms “rather than just chunk learning” as pointed out in Mansouri (2000, p. 131). A lesser accuracy level was adopted here as compared to Husseinali (2006) and others for reasons that include the cross-sectional nature of this study as well as the fewer number of participants.

2.4. Data Analysis

Both Distributional Analysis and Implicational Scaling were employed in analysing the data as suggested in Pienemann (1998a). Distributional Analysis is a linguistic analysis of the context in which learners produce a given grammatical structure. It seeks to show the presence or absence of grammatical structures under investigation in the data produced by learners (Pienemann, 1998a: 140).

Implicational scaling, also referred to as the Guttman procedure, is used in IL studies to account for evidence about how L2 learners gradually acquire grammatical features of language for a given period of time (Hatch & Lazaraton, 1991). While distributional analysis provides the opportunity “to capture the developmental nature of the learners’ language,” implicational scaling establishes hierarchy of acquisition sequences (Mansouri, 2000).

3. Description of Target Structures

The present study considered five different Arabic IL morphosyntactic agreement structures that are categorized under the phrasal, sentence and subordinate clause procedure levels of the PT processing procedure hierarchy based on analysis conducted in Mansouri (2005), Husseinali (2006), Alhawary (2009) and Al Shatter (2011).

Nominal morphology involving features of gender (masculine and feminine) and number (singular and plural) were those considered in the present study. These processing levels were selected for study because that is where exchange/matching of information (i.e.

agreement) occurs within the hierarchy. In other words, agreement in Arabic occurs within a phrase, across phrases or between clauses.

3.1. Phrasal Procedure

Phrasal procedure involves unification/matching of diacritic features between the head of a phrase and its attributive adjective, i.e. between two constituents of the same phrase (Pienemann, 1998a). In Arabic, features that unify the head phrase and its adjective include definiteness, gender, number and case (Ryding, 2005). The Noun attributive Adjective (N aAdj.) agreement structure was considered under this procedure for the present study. Unlike English, the position of adjective in N aAdj. structure is essentially post-nominal. Agreement features considered here are gender (masculine and feminine) and number (singular and plural only). The following are illustrations of some N aAdj. phrases used in the task:

1. *Taalib-u-n* *jadiid-u-n*
 student (m.s.) new (m.s.)
 i.e. ‘a new (male) student.’
2. *mudarris-at-u-n* *muHtaram-at-u-n*
 teacher (f.s.) respectable (f.s.)
 i.e. ‘a respectable (female) teacher.’
3. * *mudarris-aat-u-n* *naashiT-at-un*
 teachers (f.p.) active (f. s.)
 i.e. active (female) teachers.

Structures (1) and (2) are correct because there is agreement between the head phrase and the adjective in both gender and number. Feature matching occurred within the N aAdj. phrase, PT thus classifies this structure under stage three of the processing procedures. However, structure (3) is grammatically wrong in Arabic due to lack of feature agreement between *mudarrisaat-u-n* (female plural noun) and *naashitat-un* (female singular adjective) in number. There is no proper information exchange between the head phrase and its modifier.

3.2. S (Sentence)- Procedure

At stage four S-procedure level, exchange of grammatical information occurs across phrases. This study considered the following three agreement structures as follows:

3.2.1. Subject- Verb Order [SV (O) 3 pers.] agreement. In SVO syntactic structures, the verb agrees with the subject in number, gender and person (Bolotin, 1995). The third person pronoun in addition to the gender and number morphological features were those considered in this structure. Examples of S-V agreement structures include:

4. *al-Taalib-u* *yudhaakir-u* *al-dars-a*

the- student (m. s.) revises (3 m.s.) the- lesson

i.e. ‘the student is revising the lesson.’

5. *al- umm-u* *tunaZZif-u* *al-bayt-a*
 the- mother (f.s.) cleaning (3 f.s.) the- house
 i.e. ‘the mother is cleaning the house.’

6. * *kof-i* *taskun-u* *fii akr-aa*
 Kofi (m.s.) lives (3 f. s.) in Accra
 i.e. ‘Kofi lives in Accra.’

3.2.2. Noun predicative Adjective (N pAdj.) agreement. The N pAdj. sentences have two constituent phrases without a copular lexical verb (Alhawary, 2009). The first phrase is known in traditional Arabic grammar as *mubtada*’ while the second phrase is known as *xabar*. Normally, the *mubtada*’ and the *xabar* occur in the definite and indefinite forms respectively. Besides, the two constituent phrases must agree in number, gender and case (Ryding, 2005). For the purposes of this study, gender and number were the two features considered. The following examples illustrate the noun-predicative agreement.

7. *al-Taqs-u* *Haarr-u-n*
 the- whether (def, m. s.) hot (indef. m. s.)
 i.e. ‘The weather is hot.’

8. *al-ummuh-aat-u* *laTiif-aat-u-n*
 the- mothers (def, f. p.)soft-hearted (indef. f. p.)
 i.e. ‘Mothers are soft-hearted.’

9. **al-madras-at-u* *maftuuH-u-n*
 the- school (def. f. s.) opened (indef. m. s.)
 i.e. ‘The school is opened.’

3.2.3. Verb - Subject Order [VS (O) 3 pers.] Agreement. In VSO Arabic structures, the verb agrees with the subject with respect to gender and person features but not number (Aoun et al 1994; Bolotin, 1995). Because of this agreement asymmetry, all morphological features considered in this study shall apply for both constituents (verbal phrase and noun phrase) except the plural feature in the case of the verbal phrase. The following are some illustrations of V-S agreement structures.

10. *yashrab-u* *al-Taalib-u* *al-maa’a*
 Drinking (3 m.s.) the- student (def. m.s) the- water
 (def.)
 i.e. ‘the student is drinking water.’

11. *yaftaH-u* *al-awlaad-u* *al-baaba*
 Opening (3 m.s) the- children (def. m.s) the- door
 (def.)
 i.e. ‘the children are opening the door.’

12. **yaTbux-u al-mar'at-u al-Ta'aam-a*
 Cooking (3 m.s.) the- woman (def. f.s.) the- food
 (def.)

i.e. 'the woman is cooking food.'

With the exception of structures (6), (9) and (12), all others are grammatically correct inter-phrasal agreement structures, where exchange of information/agreement occurs across two constituent phrases. That is, between *mubtada'* and *xabar* in the case of N pAdj. and between subject and verb in the case of S-V and V-S word order agreement. These structures are thus classified under stage four of PT processing procedures.

3.3 Subordinate Clause Procedure

Exchange of grammatical information within this procedure is inter-clausal. Mansouri (2005) posits that relativisation is indicative of inter-clausal agreement as feature unification occurs across clauses. In Arabic, relative clauses (*al-Sila*) are either definite or indefinite, as in examples 13 and 14 respectively. Definite relative clause refers to a definite antecedent by using a relative pronoun. However, indefinite relative clause may refer to an indefinite antecedent, but the relative pronoun is omitted. In other words, it follows the main clause without a relative pronoun that links the two.

13. *marar-tu bi al-Taalibi alladhii haSala 'alaa al-Jaa-'iza*
 'I passed by the student who received the award.'

14. *takallama bi kalimat-in tu'zii-hi*
 'He spoke a word [that] hurts him.'

Relative pronouns *al-asmaa al-mawSuula* (الأسماء الموصولة) are inflected for both gender and number. Again, the verb in the relative clause *al-Sila* (الصلة) has to agree with both the relative pronoun and the antecedent.

In cases where the relative clause refers to an object of verb or preposition in the main clause, there should be matching of information between the embedded relative clause and the main clause through a pronoun affix known as *al-'aaid* (العائد) or the resumptive pronoun (Ryding, 2005; Husseinali, 2006).

In this study, the focus is only on the definite Embedded Adjectival clause (Embd AdjCls), which is a subordinate relative clause embedded inside the matrix clause. The indefinite clause was not considered because it is more marked and requires higher grammatical aptitude which participants have not been introduced to. The following examples illustrate information exchange between the embedded relative clause and the main clause.

15. *jaa'a al-mudarris-u alladhii ra'aitu-hu 'amsi*
 Came the-teacher(m.s.) who (m.s.) saw(1pers.)-him
 yesterday

i.e. ‘the teacher whom I saw yesterday came.’

16. *waSal-a al-laa^cibuuna alladhiina karrama-hum al-ra²iis*

arrived the- players (m.p.) who (m.p.) honoured-
(3pers.p.) the- president

i.e. ‘the players who were honoured by the president have arrived.’

17. * *haa²ulaa-i al-Tullab-u humu alladhii yujiiduu al-^carabiyya-ta*

These (3 pers.) students (m.p.) who (m.s.) know the- Arabic

i.e. ‘these are the students who know Arabic.’

Examples (15) and (16) show: (i) feature matching between the embedded relative clause and the main clause, and (ii) agreement matching between the relative pronoun and the resumptive pronoun. This is feature unification across clauses and therefore falls under the stage five subordinate clause processing procedure. On the other hand, structure (17) is ungrammatical in that there is no feature matching between the main clause and the sub-ordinate clause. While the antecedent (*zumalaa-u-n*) is masculine plural, the relative pronoun of the subordinate clause (*alladhii*) is masculine singular.

The five morphosyntactic agreement structures described above have been predicted to be acquired at the phrasal procedure stage, S-procedure stage and sub-ordinate clause stage of PT’s

processing procedures stages. These processing levels were selected for study because that is where exchange/matching of information and, for that matter, agreement occurs within the hierarchy.

4. Results

Analysis of group 1 data, (see Table 3), showed that three out of the five learners acquired N aAdj. structure, which is a stage three agreement structure. Within the S- procedure structures however, it was only the N pAdj. that was acquired and none of the participants acquired the SVO and VSO structures. There is a variation here within the same stage, in that although learners did not acquire SVO structures they were able to acquire the N pAdj structure. This however does not contradict the theory because PT does not claim that all structures within a stage have to be necessarily acquired before the next stage.

Again, the data showed that all learners scored zero in the EPT for the SVO structure. In other words, none of the participants in group 1 could produce a correct SVO structure in the production task. However, some were able to identify whether an SVO structure is grammatical or not in the GJT, albeit at a low frequency level between 25% and 42%.

Table 3 *Production of Agreement Structures from the GJT and EPT Tasks by Group 1*

Sta ge	Structure	Surea	Muhim	Ibzia	Euase	Kpice
3	N aAdj.	5/8; 2/4	6/8;	3/8;	4/8;	4/8;
		58% (+)	3/4 75% (+)	1/4 33% (-)	1/4 42% (-)	2/4 50% (+)
4	SVO	3/8; 0/4	3/8;	4/8;	3/8;	5/8;
		25% (-)	0/4 25% (-)	0/4 33% (-)	0/4 25% (-)	0/4 42% (-)
	N pAdj.	6/8; 2/4	7/8;	5/8;	6/8;	5/8;
		67% (+)	1/4 67% (+)	1/4 50% (+)	1/4 58% (+)	1/4 50% (+)
VSO	4/8; 1/4	4/8;	4/8;	2/8;	5/8;	
	42% (-)	0/4 33% (-)	1/4 42% (-)	2/4 33% (-)	0/4 42% (-)	
5	Relativis ation	3/8; 0/4	4/8;	6/8;	3/8;	3/8;
		25% (-)	1/4 42% (-)	.5/4 54% (+)	.5/4 29% (-)	0/4 25% (-)

Note. Denominator = possible contexts; Numerator = tokens (i.e. correct production of a structure); First fraction = GJT task; Second fraction = EPT task; % = percentage ratio of the sum of tokens (e.g. 5+2=7) and the sum of the contexts (i.e. 8+4=12) for both tasks; (+) = structure has emerged; (-) structure has not emerged.

Analysis of group 2 data, (see Table 4), illustrates the development of target structures in the group. The distribution shows that all learners, with the exception of Abkpo, acquired the stage

three agreement structure, i.e., the N aAdj. In fact, three out of the four students attained a 75% accuracy level out of the two tasks.

Abkpo however appears to have a problem in producing structures for the EPT task in all the processing stages. She scored zero in production task for the N aAdj. structure as well as the other structures. Even with the GJT task, her scores for the SVO and VSO structures were relatively low.

All learners in this group showed evidence of acquisition of the N pAdj. structure. For the SVO and VSO structures however, the data showed that two learners exhibited evidence of acquisition of each of the two structures. SVO structures appears to be more marked as

evident even in English. Hakansson (2017) also indicated that L2 learners of English equally struggle with the acquisition of subject-verb agreement.

Ironically, Table 4 suggests that three out of the five learners showed evidence of the acquisition of an embedded Adjectival clause agreement structure, which is a stage five processing procedure structure. Individually, they seemed to have performed well in the production task more than the grammaticality task.

Table 4 *Production of Agreement Structures from the GJT and EPT Tasks by Group 2*

Stag e	Structure	Ummed	Zazah	Ajman	Abkpo	Absir
3	N aAdj.	6/8; 3/4 75% (+)	5/8; 4/4 75% (+)	3/8; 3/4 50% (+)	5/8; 0/4 42% (-)	6/8; 3/4 75% (+)
4	SVO	8/8; 1/4 75% (+)	5/8; 0/4 42% (-)	4/8; 0/4 33% (-)	3/8; 0/4 25% (-)	6/8; 0/4 50% (+)
	N pAdj.	7/8; 3/4 83% (+)	7/8; 2/4 75% (+)	5/8; 1/4 50% (+)	6/8; 0/4 50% (+)	4/8; 2/4 50% (+)
	VSO	4/8; 1/4 42% (-)	5/8; 1/4 50% (+)	6/8; 3/4 75% (+)	3/8; 0/4 25% (-)	3/8; 1/4 33% (-)
5	Relativisati on	4/8; 3/4 58% (+)	5/8;3.5 /4 71% (+)	4/8;1.5 /4 46% (-)	2/8; 0/4 17% (-)	3/8;3.5 /4 54% (+)

In summary, data from group one generally provided evidence for acquisition of stage three N aAdj. structure as well as N pAdj. structure, which are phrasal and inter-phrasal structures respectively.

Data from group two provided evidence for acquisition of phrasal structure. Most learners also exhibited evidence for acquiring stage three inter-phrasal structures. The SVO and VSO structures have not emerged among some learners within this group. Besides, the fact that both belong to the same stage does not necessarily mean they will emerge at the same time (Hakansson, 2017). The data however showed that some of them have acquired the embedded adjectival relative clause structure.

Finally, data from group three provided evidence for the acquisition of the three processing procedures (phrasal, inter-phrasal and inter-clausal) by the respective learners, with the exception of one learner for both the VSO and the relativisation structures.

Table 5 *Production of Agreement Structures from the GJT and EPT Tasks by Group 3*

Stage	Structure	Ilidu	Rieem	Elbbi	Akeed	Maade
3	N aAdj.	6/8;	7/8; 3/4	5/8;	7/8; 4/4	4/8; 3/4
		4/4	83% (+)	2/4	92% (+)	58% (+)
		83%		58%		
4	SVO	6/8;	8/8; 3/4	7/8;	8/8; 0/4	4/8; 1/4
		1/4	92% (+)	0/4	67% (+)	42% (-)
		58%		58%		
	N pAdj.	6/8;	8/8; 4/4	5/8;	8/8; 4/4	6/8; 2/4
		4/4	100%	3/4	100%	67% (+)
		83%	(+)	67%	(+)	
VSO	7/8;	6/8; 3/4	3/8; 1/4	8/8; 3/4	5/8; 2/4	
	3/4	75% (+)	4	92%	4	
	83%		33% (-)	(+)	58%	
5	Relativisation	8/8; 2.5/4	6/8;	4/8;	6/8; 4/4	4/8; 2/4
			3.5/4	0/4	83%	50% (+)
		88%	79% (+)	33%	(+)	
		(+)		(-)		

Table 6 is an implicational scaling showing an amalgamated performance of all the three groups in respect of the acquisition of the morphosyntactic structures under investigation. In order to determine their developmental trajectories, their performances (acquired / not acquired) were pulled together and that resulted in the scalogram shown in table 6.

All learners (with the exception of three students) appeared to have acquired stage three N aAdj. structure. The number of non-acquirers of the N aAdj. structure reduced as the level of learners advances from level 200 (group one) to level 400 (group three).

Evidence from learners' data showed that all the three groups showed evidence for the acquisition of the N pAdj. structure. In fact, that was not expected for group one because it is a stage four structure and was predicted to be acquired by group two and above.

Apart from few instances, the scalogram points to the fact that most of the structures investigated were acquired as predicted by PT.

With only 10 errors occurring in the scalogram out of the 75 items, the scale is fairly implicational. It illustrates a fair order of acquisition of morphosyntactic structures investigated. Errors refer to cases where learners missed structures they were expected to acquire or acquired structures they were not expected to acquire. These are the minuses to the right of the implicational line and pluses to the left of the line. It is also important to mention that no data is perfect and so limited deviations from the perfect pattern are allowed in implicational scaling (Buyl, and Housen, 2015). Following Pienemann, M. & Keßler, J.-U. (Eds.) (2011) (p. 94), the coefficient of scalability of the implicational table (see Table 6) is 87%. Statistically, this suggests an implicational hierarchy between the processing procedures.

5. Discussion

Pienemann (1998a) predicted that the acquisition of morphosyntactic structures follows the following implicational processing procedures: word / lemma access > category procedure > phrasal procedure > sentence procedure > subordinate clause procedure. In other words, language procedures develop in a learner in an implicational order. Thus, the next stage in the hierarchy is accessible if the learner is able to process the previous stage. The present study investigated processing procedures at the third, fourth and fifth levels, namely the phrasal procedure, the sentence (inter-phrasal) procedure and the subordinate clause procedure.

Table 6 *Implicational Scaling of Morphosyntactic Structures for all Participants*

Structure	Group One					Group Two					Group Three				
	Surea	Muhim	Ibzia	Euse	Kpice	Ajman	Akpo	Umed	Zazah	Absir	Iidu	Rieem	Elbibi	Akeed	Maade
Relativisation	-	-	-	-	-	-	-	+	+	+	+	-	+	+	
VSO	-	-	-	-	-	+	-	-	+	-	+	+	-	+	+
SV O	-	-	-	-	-	-	-	+	-	+	+	+	+	+	-
NpA dj	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
NaA dj	+														

The emergence of the N pAdj. structure (a stage 4 structure) among group one and the inability of some group two participants to acquire the SVO and VSO structures within the S- procedure stage poses no challenge to the PT framework. PT predicts these structures to emerge among group two and three but not group one as shown in Table 1. Although this may look like evidence of inter-stage variability, which PT hypothesizes to be unfeasible in the processing procedures, the emergence of a structure, for example the N pAdj., does not necessarily imply that all other structures with similar information exchange procedure should emerge prior to the emergence of a higher-level processing procedure structure. In fact, Ellis (2008) noted that learners do not acquire all features related to a particular stage before they move on to a higher stage.

In as much as the N pAdj., SVO and VSO structures fall within the same processing procedure stage, the development of SVO and VSO among group two learners revealed the issue of developmental trailers (i.e. structures which emerge late) among that group. Speaker variation in processing of the SVO and VSO structures might be as a result of learners “diverse orientations towards the acquisition of either syntax or morphology” (Dyson, 2016, p. 341). However, the N pAdj. seems to be a typologically unmarked structure and that lead to its earlier acquisition in the case of group one and developed incrementally among group two and three. Findings emanating from the Noun Phrase Accessibility Hierarchy (NPAH) framework lent support to the fact that unmarked positions/structures tend to be acquired earlier than marked positions (Braid, 1999; Doughty, 1991).

Besides, the performance of participants in the N pAdj. structure cannot be traced to cross-linguistic influence for two reasons, first, due to lack of empirical evidence from the data to

support that claim and second, due to PT’s theoretical assumptions about L1 transfer in language processing that “L1 transfer is constrained by the processability of the given structure” (Pienemann, Di Biase, Kawaguchi & Hakansson, 2005, p. 132). In effect, L2 learners can transfer features of L1 if and only if those structures can be processed by the learners’ current processing ability. Huseinali (2006) also hypothesized that the role of L1 in the IL system of SLL is not automatic. It is however important to point to the fact that, Alhawary (2009a) considered inter-stage variability in the data of his participants as evidence of L1 transfer. He relied prominently on the Full Transfer/ Full Access Hypothesis to come to this conclusion. He argued that developmental paths and for that matter acquisition of grammatical structures are not explained on the basis of processing constraints only, but by other factors like the Full Transfer/Full Access Hypothesis as well.

I speculate that there might be other factors other than processing constraints that may have had led to the early acquisition of the N pAdj. structure as alluded to in Alhawary (2009a). Apparently, the N pAdj. structure seems to be less marked in the IL system of the participants. Ellis (2008, p. 578) maintained that “learners find it easier to acquire typologically unmarked structures than typologically marked structures.”

As far as relativisation is concerned, group three was the only group that exhibited a strong evidence for the acquisition of Embd AdjCls. This was expected because the subordinate clause procedure (i.e. where the relativisation structure is located) involves a relatively higher exchange information process. The learner should be able to differentiate between the main clause and the embedded relative subordinate clause at this level.

Contrary to PT predictions, the Embd AdjCls emerged earlier among some few learners (i.e. 3 out of 10) in group one and two. Yamaguchi & Kawaguchi (2016) in their study of the development of relative clauses in English L2 also found that some relative clauses emerged at the earlier stages of their informant. In fact, they indicated that relative clause constructions can be acquired at the S-procedure stage (p. 91).

In determining whether or not the results of the present study provided evidence for the stability of developmental stages for the purpose of cross-linguistic plausibility of the theory, analysis of participants’ data showed that there was no incident of a lower group acquiring some structural outcomes but not the next upper group. Instead, what we saw was a case of cumulative development in terms of the acquisition of structures.

Figure 1 is a graphical overview of the acquisition of target structures by learners. It shows that:

1. All the three groups acquired the NaAdj. structure, scoring ≥ 50 % threshold of the pre-defined acquisition criterion.
2. There is no evidence of acquisition of SVO and VSO structures by group two. All groups acquired the N pAdj. structure.
3. Only group three acquired the stage three relativisation structure.

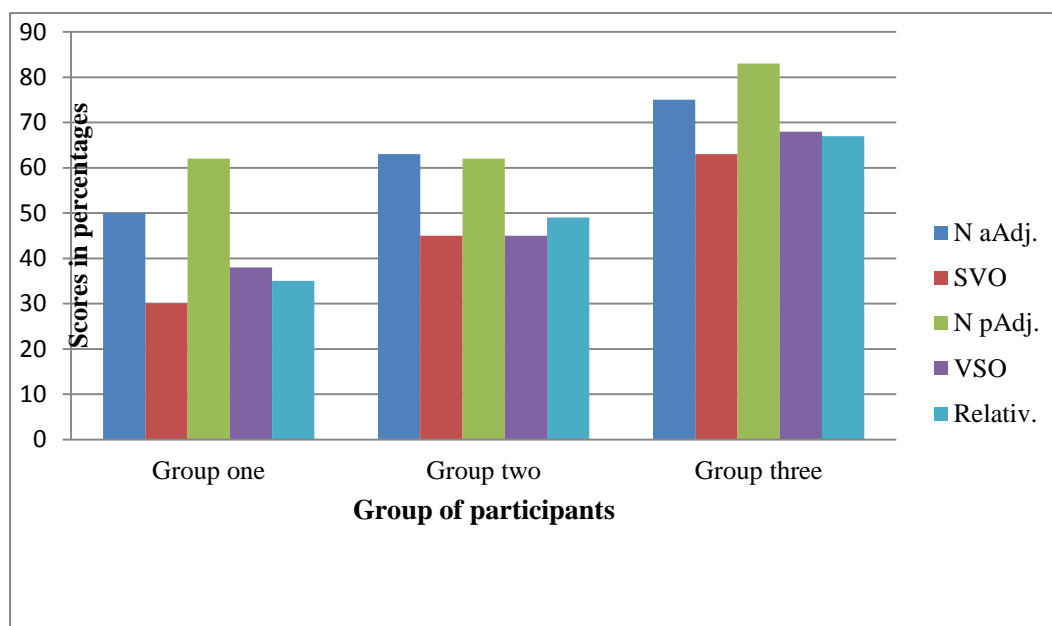


Figure 1. Graphical representation of scores for all the three groups.

6. Conclusion

The present study investigated the acquisition of Arabic morphosyntactic agreement structures in the IL system of AFL learners in Ghana. The PT was used as a framework for the study; because of its explanatory and predictive power about how syntactic and morphological structures are acquired. Five morphosyntactic Arabic agreement structures were investigated. These are the N aAdj., SVO, N pAdj., VSO and Embedded Adj. clause. The gender and number inflectional features were the morphological features considered in the study. These structures represent three developmental stages on the PT implicational hierarchy, namely the phrasal, sentence and subordinate clause procedure levels.

The study produced a number of results that are largely in congruence with PT predictions. It revealed that developmental route for agreement structures by AFL learners in Ghana is as follows: phrasal procedure > S- procedure > subordinate clause procedure. Thus, there exist a hierarchy between these processing procedures. The findings of this study and others taken together suggest the cross-linguistic plausibility of PT predictions.

However, the behaviour of the N pAdj. structure in the IL system of the participants is considered as relevant discovery. The study showed that N pAdj., which is a stage four structure emerged among the first group, although that was predicted to emerge among the second and the third groups. Arguably, that does not seem to affect the predictions of the theory, because it was not an explicit case of inter-stage variability, where a lower group acquired it but not a higher one. Concerning the stability of those developmental

trajectories, the study concluded that the emerged developmental trajectories were generally stable due to the absence of inter stage variability.

In as much as PT accounts for entire morphosyntax of target languages and not their isolated aspects, the early acquisition of the N pAdj. agreement structure suggested that another factor, other than processing constraints was involved in the processing architecture of Arabic L2 learners in Ghana. That in effect may constitute a counterevidence to the claim of cross-linguistic plausibility of Pienemann's Processability Theory. It needs to be noted that additional research must be carried out in respect to the N pAdj. to validate the finding.

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اكتساب تراكيب التوافق اللغوي لدى متعلمي العربية الغانينين:
دراسة في ضوء نظرية المعالجة

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الملخص:

تناولت الدراسة طبيعة اكتساب تراكيب التوافق اللغوي لدى متعلمي اللغة العربية كلغة أجنبية في غانا على ضوء نظرية المعالجة (*Processability Theory*) التي أسس لها منفرد بنمن (١٩٩٨م). قامت الدراسة بالتحقق من خمسة تراكيب التوافق تقع تحت مراحل عمليات المعالجة الثلاث في دراسة مقطعية مستعرضة، وهي: مرحلة المركب، ومرحلة الجملة، ومرحلة النص، ضمن مراحل عمليات التطور اللغوي الخمس التي تتطوي عليها النظرية. وهدفت هذه الدراسة إلى تأكيد صحة تنبؤات الطبيعة التراكمية والتصاعدية لمراحل معالجة اللغة التي صنفتها النظرية، وتم جمع البيانات من خمسة عشر طالبا في مستويات مختلفة، من بين طلاب جامعة غانا الذين يتعلمون اللغة العربية كلغة أجنبية. أما الأدوات المستخدمة في جمع البيانات فتمثلت في مهمتين: الأولى في الحكم على صحة قاعدة نحوية (*Grammaticality Judgment Task*)، والأخرى في إنتاج اللغة المستنبط (*Elicited Production Task*). أظهرت نتيجة الدراسة أن اكتساب تراكيب التوافق لدى الغانينين الذين يتعلمون اللغة العربية كلغة أجنبية يتطور حسب تنبؤات النظرية، ورغم أن الدراسة تتوافق مع تنبؤات النظرية عموما، إلا أن طبيعة جملة المبتدأ والخبر في نظام لغة المتعلمين المشاركين في الدراسة تشير إلى أن هناك عوامل أخرى - غير معوقات المعالجة - قد تشارك في بنية المعالجة لمتعلمي اللغة الثانية في غانا.

الكلمات المفتاحية: تراكيب التوافق، لغة المتعلمين، متعلمي اللغة العربية كلغة أجنبية، المسارات التطورية، نظرية المعالجة.