Maturational Constraints on SLA:
Accessibility to Universal Grammar

(محدودیتهای ناشی از سن بلوغ در یادگیری زبان دوم: دستیابی به دستور جهانی)

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چکیده: برخی از دانشمندان بر این باورند که بین سنی که فرد یادگیری زبان دوم را آغاز می‌کند و توانش زبانی او در این زبان رابطۀ منفی وجود دارد. چنین فرض شده است که بلوغ زیستی برای یادگیری زبان ایجاد محدودیت می‌کند. البته، تمام عرصه‌های زبان در افراد گوناگون در زمانی واحد تحت‌تأثیر این محدودیت قرار نمی‌گیرند. این مقاله به دنبال آن است که تأثیرات این دورۀ حساس را تا چه حد می‌توان در مشخصه‌های جهانی زبان، که ذاتی تلقی می‌شود، جست. همجواری، اصل مقوله‌تهی (ESP) یا معلول ـthat رد، و وابستگی ساختاری، ساخته‌های ذاتی مبتنی بر فرضیه‌اند که در این مقاله بررسی می‌شوند. آزمون به دو بخش تقسیم می‌شود: نقضهای متغیر و ثابت. از نظر ما، نتایج مطالعۀ حاضر نشان می‌دهد که تأثیر منفی شدیدی بین افزایش سن شروع یادگیری زبان و تشخیص نقضهای دستور جهانی از جانب یادگیرنده وجود دارد. علاوه بر این، تفاوتهای گروهی نیز اهمیت دارند، چرا که عملکرد گروه ۱ همواره در حد سخنگویان بومی بود؛ گروه ۲ در بسیاری موارد نتوانست در حد بومی عمل کند؛ گروه ۳، در هیچ یک از شرایط تحت بررسی، نتوانست به حـد

بومی و گروه ۱ برسد. می‌توان نتیجه‌گیری کرد که (الف) سطح نهایی عملکرد یادگیری زبان دوم به سن شروع یادگیری بستگی دارد، (ب) دوره‌های حساسی وجود دارد که پیشرفت زبانی را کنترل می‌کند، دوره‌هایی که طی آنها فراگیری قابلیتهای گوناگون زبانی بسیار ثمربخش است، اما بعد از این دوره یادگیری زبان نامنظم و ناقص خواهد بود، (ج) آسیب ناشی از به تعویق افتادن سن شروع یادگیری افزایشی است و هرگز متوقف نخواهد شد. حاصل دیگر این مطالعه آن است که چون فراگیران زبان در هیچ یک از دو نوع نقض به پای سخنگوی بومی نمی‌رسند، نتیجه می‌گیریم که سن یادگیری بر هر دو نوع دانش دستور جهانی ـ متغیر و ثابت ـ مؤثر است. نتیجه این می‌شود که سن آغاز یادگیری تأثیر چشم‌گیری بر دستاورد نهایی زبان‌آموزان در زبان دوم دارد.

کلیدواژه: دورۀ حساس، محدودیتهای دوران بلوغ، دستور جهانی، یادگیری زبان دوم.

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Second Language Learning and Critical Periods

After the series of research done by Penfield and Roberts (1959) and Lenneberg (1967), a postulation in language acquisition domain emerged as to the existence of a critical period for language acquisition, an age limit which blocks the ultimate attainment by both L1 and L2 learners. A kind of biological scheduling was assumed to be responsible for this maturational constraint on language development. Age–related loss of heightened responsiveness in language learning also should be variable in onset and effect. The presence of CP in Second Language Acquisition (SLA) was much hotly debated since SLA is a melting pot in which many other factors besides biological maturation come into play. People commonly believe that success in L2 learning depends on the age of the learner. Chomsky, for instance, commented in his celebrated Review of Verbal Behavior "it is a common observation that a young child of immigrant parents may learn a second language in the streets, from other children, with amazing rapidity... , while the subtleties, that become second nature to the child may elude his parents, despite high motivation and continued practice" (Chomsky, 1959, p. 49). However, Lamendella (1977) believed that since no structural or functional atrophy of neural systems has taken place in the language systems of normal adults and, since many adults clearly can reach high levels of second language competence, it is not legitimate to

talk about a critical period in this context. A better approach is to ask whether there is a *sensitive period* for nonprimary language acquisition (p.216).

Johnson and Newport (1989: 64) used the term "exercise hypothesis" which holds that the capacity for second language acquisition, once activated, is expected to keep acting permanently for subsequent learning of additional languages. They also wrote about a second position termed "maturational state hypothesis" which holds that this capacity, like all other human capacities, is biologically scheduled to be used in specific periods of time and, whether one uses this capacity or not, it declines or vanishes at a certain age. Long (1990) concludes that the literature on Critical Period Hypothesis ends up with the radical, strong version of Johnson and Newport's maturational state hypothesis.

Krashen, Long and Scarcella (1982) in their brief comment observed that the literature then available to them was consistent with three generalizations with regard to age, rate and eventual attainment [now it is called ultimate attainment (White 1989a)] in the process of second language acquisition, they presented the three generalizations as follows:

(1) Adults proceed through early stages of syntactic and morphological development faster than children (where time and exposure are held constant).

(2) Older children acquire faster than younger children (again, in early stages of

syntactic and morphological development where time and exposure are held constant).

(3) Acquirers who begin natural exposure to second language during childhood generally achieve higher second language proficiency than those beginning as adults (white,1989a: 161).

There are some short–term studies which target only the differential rate in acquisition, and they do not take ultimate attainment into account. They support the first generalization (Asher and Price, 1967; Schmidt, 1986; Olson & Samuels, 1982; Seright, 1985). However, as for the second conclusion arrived at by Krashen, Long and Scarcella (1982), there are many studies which support that older learners outperform the younger ones in rate of acquisition of morphology and syntax (Ekstrand, 1976; Snow & Hoefnagel–Hohle, 1978; Collier, 1987). Tahta, Wood, and Loewenthal (1981b) came up with findings in apparent conflict with the second conclusion. However, with regard to the third generalization some studies show that even after years of receiving naturalistic and/or formal exposure to the second language, adult learners can not achieve native like proficiency in the second language. Sensitive or critical period might not be bound to phonology and it might be extended to syntax and grammar on the whole also (Patkowski, 1980b; Johnson and Newport, 1989; Johnson, 1992; Coppieters, 1987).

Accessibility of UG in Second Language Acquisition

This is now a very common question: are universal grammar principles and parameters accessible in second language acquisition?

White (1989b) presents five logical possibilities: (a) UG is accessible in L2 acquisition and its function is the same as L1 acquisition, (b) UG is completely accessible, but L2 learners initially transfer the settings of the L1, (c) UG is accessible but only through L1 settings, (d) UG is accessible but its function is different in L1 and L2, (e) UG is not accessible in L2 acquisition. Braidi (1999) gives a concrete example to make the issue more tangible. Bley –Vroman believes that UG is not directly accessible to L2 learners, in L2 acquisition L1 grammar and a 'general abstract problem solving system' replace the role of UG in L1 [see also Clahsen & Muysken (1986) who favor information processing and general-problem solving principles in L2 acquisition]. Bley-Vroman (1987) claims that even if L2 learners can determine violations of UG in grammaticality judgment test, it doesn't mean necessarily access to UG, correctness judgments may come from many cognitive domain. But as Clahsen and Muysken (1986) pointed out, what if the adult L2 learners can detect violation of complex structures in L2 such as ECP and subjacency and if it can be shown that parameter setting happens in L2 as it does in L1.

Schachter (1989b) and Johnson and Newport (1991) suggested that whatever the nature of

the endowment that allows humans to learn language, it suffers from a very thorough deterioration as learners become increasingly mature.

However, there are studies showing that UG is accessible to L2 learners. White (1989a) proposes that L2 acquisition like L1 may involve the knowledge of some highly constrained principles of UG. White and Genessee (1996) claim that ultimate attainment is possible for L2 learners though they admit that they have a lower chance to reach such levels of competence. About parameter resetting, Flynn's study (1988) is one of the strangest claims implying that when there is a mismatch between the values of parameters associated with the principles, learners assign a new value consistent with the value of the given parameter in L2. Clahsen and Muysken (1986) argued that the adult second language learner does not have access to UG. In rebuttal, dePlessis et al have proposed that the errors of the adults in Clahsen and Muysken's study reflected a difficulty with setting or resetting the parameter of the universal, and not with following the related principle, they claimed that all the errors made by the adult subjects were within the territory of possible grammars permitted by the universals (dePlessis, Slobin, Travis & White, 1987).

Methodology

This part describes the goal of the study, the pilot study, the changes made in the main test as a result of the pilot study, the overall design of the study, the subjects, the test, the sub-tests, data collection procedure, scoring systems, and the analyses performed. Moreover, the procedure followed in categorizing the subjects based on their onset age will also be discussed.

The Goal of the Study

The main goal of this study was to test how the onset age, the age in which the learners start acquiring the second language in an English-speaking environment, affects their access to UG. Moreover, three age groups were compared with each other and with the native speakers in order to see which of the age groups perform more similarly to the way the native speakers perform. The test has three main sub-tests which are fully described in the relevant section.

The study tries to see if the age of onset has a determining effect on the way the subjects treat the second language. If UG is accepted as a criterion for the learners' access to the genetically endowed linguistic knowledge and we find out that some subjects can not detect violations of UG type, then one possible inference would be that they are treating the language like other forms of knowledge, different from the way a child, the typical native speaker, approaches the second language, therefore; they lack the ability to acquire a fully blown language similar to that of the native speakers. This by itself proves

the necessity of starting the second language learning at early ages. Different justifications and proposals for this lack of ability to access UG type knowledge are put forward. One point which is worth mentioning here is that in spite of the fact that we have fluctuations, sometimes drastic ones, in the way scholars justify UG principles and the related violations, research in the second language can take advantage of the learners' ability to detect UG violations irrespectable of any of the approaches in UG oriented linguistics. That is, everybody agrees that for example extraction from the sentential subjects violates some principle in almost all known languages, the different and ever changing approaches in dealing with this phenomenon can not deter the second language researchers to tab the learners' knowledge on this structural deformity, second language researchers can not wait till the linguists reach a unanimous agreement on linguistic phenomena.

The Pilot Study

In order to find the potential problems with the test, tackle the methodological problems and modify the items and the instructions which might distort the test, a preliminary study was conducted in Iran, the participants were 50 Persian learners of English as a second language at Allame Tabataba'i University, faculty of foreign languages. To protect the validity of the test the learners were not informed about the purpose of the test. Some changes were made to the preliminary test. The original test had 56 items, there were 6 items for each of the violations and it was accompanied by a 1996 version of TOEFL test, in the modified version which was used in Canada for Persian learners of English as a second language we had 62 items in subjacency and ECP sub-test and five items for structure dependency, ECP was added in the final test and an 11 item cluster sub-test was also developed which acted both as distracters and a separate sub-test. Instead of the TOEFL test a syntax test was used as a filter to make sure that the students do have the linguistic proficiency to take the UG test, the exclusion of TOEFL was mainly because of practical problems; in Canada it was impossible to convince the subjects to take part in a two–session test, subject mortality could be very high; moreover, literature confirmed that the syntax test is sufficient for the purpose of this study.

Research Questions

We tried to answer the following seven main questions in this study:

(1) Is there any relationship between the subjects' onset age and the ten variables (TTE, EQ, SS, RC, NC, Sum of Varying Violations, Sum of Invariant Violations, Sum of Total Violations, Structure Dependency and Cluster Sub-test)?

(2) Does age group have any impact on the knowledge of Persian Learners of English as a Second Language (PLESL) of UG violations (Subjacency and ECP)?

(3) Does age group have different effects on the knowledge of PLESL on Varying and Invariant violation types?

(4) Are the four age groups different with regard to any of the five structures in Varying and Invariant violation types?

(5) Does each of the four groups perform differently on the five structures in Varying and Invariant violation types?

(6) Do the four groups perform differently as to Structure Dependency as on of the sub-tests?

(7) Do the four groups perform differently as to Cluster sub-test?

The Subjects

There were 78 subjects who were Persian speakers of English as an L2; 20 native speakers of English served as controls. To qualify as a second language learner in this study, subjects' arrival in Canada, and consequently their first immersion in the English language, had to occur at least at the age of three. We did not consider subjects with the age of onset below three since in that case they had to be considered the native speakers of English; on the other hand, many scholars in the field believe that the first critical age in second language acquisition

occurs after the second year of age. The 76 subjects participating in this study arrived in Canada between the ages of 3 and 38, with a mean age of arrival of 16.5.

All the learners who arrived in Canada after the age of 14 had some very formal training in English in Iran; in other words, the adult learners in this study had at least some English training through formal classroom instruction at an earlier age while they were in Iran where formal English teaching starts at the second grade of Rahnamai (guidance) school (7th grade after the beginning of primary school when second language learning starts around the age of 13, primary school starts at 7).

These adults generally continued English classroom training throughout high school and university. The earlier training in English naturally brings up the question as to whether these subjects could be truly classified as adult learners of English. The literature suggests that whatever natural endowment confers upon the language-training process, it is limited to the natural learning situation (i.e., immersion) and not to the highly formal classroom setting in which the subjects were exposed to (Johnson and Newport 1989). For this reason, then, age of exposure to English in the present study is based on age of immersion (onset age).

To qualify for this experiment the subjects had to have sufficient exposure to English to be considered at their ultimate attainment in

language. Previous studies have shown no effects of length of exposure with the language for adult learners of a second language after 5 years of exposure (immersion kind) in the second language (Oyama, 1978; Johnson & Newport, 1989). The requirement of minimum years of exposure in this study was also taken to be 5 years before the time of test. However, a syntax test is also devised in the test (with 6 items tapping their knowledge on four main constructions of which they had to detect the violations in the UG part of the test on a 1 to 5 Likert scale). Subjects who had under five years of exposure to English or could not pass the syntax test (by getting 16 out of 20 for each of the constructions: Relative clause, embedded question, noun complement, and sentential subject) were excluded, only two subjects were excluded because of the second reason, we did not give the test to those who had under 5 years of exposure either. Out of these 78 subjects, three main age groups were made. 22 subjects comprised the first age group: 3-9; 24 subjects belonged to the second age group: 10-16; and 32 subjects were regarded as the third group: 17-36, bear in mind that here we are referring the age of first exposure to immersion in the second language or the age of onset. In addition, 20 native speakers acted as controls.

The Test
The test comprises the following sub-tests:

Subjacency:
The subjacency principle places restrictions on the type of extractions which can be made, based on this principle extractions from the following structures are UG type violations. In this part of the test, there are four subjacency violation types:

a) Extraction from the sentential subjects:
Who was for a student to disagree with t impossible in his country?

b) Extraction from the noun complements:
Which paper did the professor refuse to believe *the claim that someone had stolen t?*

c) Extraction from the relative clauses:
Who did the news reporters surround the cabinet officer *that had criticized t?*

d) Extraction from the embedded questions:
Which test don't you know *who failed t?*

In this part, there are five items for each of these constructions on a 1 to 5 Likert scale, using a continuous rather than a dichotomous evaluation of competency, we intend to provide a more complete understanding of the second language learner's knowledge, or lack of knowledge, of subjacency and That-trace Effect.

Historically, this universal principle was first called the *A-over-A* principle (Chomsky, 1964). Then *island constraints* (Ross, 1967), and only more recently has it been reanalyzed and renamed *subjacency* (Chomsky, 1981). This principle was chosen because it is well developed and understood and has stood the

test of time.

For the purpose of this study, the way the current formulation of this principle works is less important; irrespectable of the particular linguistic theory we adopt, the descriptive facts have remained the same, in second language acquisition studies, we can not postpone research in the field till linguists come up with a unique formulation of the principles. In addition, the psychological validity of subjacency is empirically supported with first language learners of English, Children observe this principle as soon as they acquire the relevant structures to which this principle applies (Otsu, 1981). The goal of this study is to see if that is true of learners exposed to English as a second language, and if it is true for younger and older learners alike.

Some of these subjacency violations are considered ungrammatical both in Persian and English, may be this is the case in all other languages (Johnson & Newport, 1991), these we will refer to as *invariant* subjacency violations. In this test, however, certain wh-movements are grammatical in some languages and ungrammatical in others. In our case, they are grammatical in Persian but ungrammatical in English. These we will refer to as *parametrically varying* subjacency violations.

In the subjacency part of this test, the structures (1), (2), and (3) are Invariant violations, that is, SS, NC and RC. While structure (4), EQ is respected as

a parametrically varying subjacency violation (a full discussion and the equivalent Persian structures and their transcripts are given in the literature).

Empty Category Principle (ECP) or *that trace* effect:
This refers to extraction of the subject of the embedded question, when *that* is not deleted:

Who do you think *that t arrived yesterday*?

In this part of the test, the subjects were supposed to detect the ungrammaticality of the sentences and determine the degree of their competence on a 1 to 5 Likert scale, as it was the case for the four constructions of subjacency violation. This structure is also parametrically varying between English and Persian.

Structure Dependency
Although Structure Dependency is a principle which is supposed to apply to all languages, the structure under analysis here does not apply to Persian. In English when we have a relative clause and we want to make an interrogative *yes / no* question as in: *The man who is climbing the tree will be bitten by the snake*, the auxiliary is extracted from the main clause and not form the relative clause. Since in Persian interrogative *yes/no* question is either made by rising intonation or by bringing the *yes/no* question marker *"aya"* at the

beginning, the relevant information can not be transferred from Persian to English. We asked the subjects to transform five statements each including a relative clause into interrogative forms.

In brief, in the three sub-tests in this study, subjacency, ECP, and structure dependency, we have six constructions, four kinds of extraction resulting in subjacency violation, the extraction leading to an ECP violation, and the extraction of the auxiliary from the relative clause denoting the lack of competence for structure dependency (at least for this specific construction).

With such a test, effects of age of acquisition on these universals can be examined in two ways. First, we can ask whether age of acquisition is related to performance on subjacency, ECP, and structure dependency overall, pooling items that test subjacency and ECP at one hand and structure dependency on the other hand. If adults perform as well as the native speakers and child learners on these sets of items and we find *insignificant* correlation between age and their ability in doing the tests, we conclude that age of acquisition does not affect the use of these language universals or the parametrically varying aspects of the structures under study.

On the other hand if adult learners do not perform as well as the native speakers and/or if there is a *significant* negative correlation between age of onset and the subjects ability to detect the

violations for subjacency and ECP subtests and also between age of onset and their ability to observe structure dependency in *yes/no* question formation sub-test, we can examine their performance in more detail to see if age of onset affects only the parametrically varying aspects of the test; that is, extraction from the embedded question, ECP, and structure dependency, or it affects the invariant aspects of the test as well that is, extractions from the sentential subjects, the noun complements, and the relative clauses. Poor performance on the invariant aspects of the test which belong to subjacency in this study would suggest that maturation may lead learners to violate language universals even if these universals work in the same way in their mother tongue. Good performance on the invariant aspects but poor performance on the parametrically varying aspects, however, would suggest that maturation does not lead learners to violate language universals in the extreme, but only to have difficulty determining the parameter setting of the new language; that is, if the setting of the given parameter is different for L1 and L2 the learners will find it difficult to reset the parameter from L1 parameter to L2 parameter (for an extensive discussion on parameter setting you may refer to the literature of this study).

In addition to the three sub-tests of subjacency, ECP and structure dependency with 20, 5 and 5 items respectively there is a cluster of 11 sentences with UG type

violations which are specific to English and they are not considered violations in Persian. This cluster has two functions here, as distracters and a separate sub-test.

A syntactic sub-test is also included in the test to make sure that the subjects have the linguistic knowledge about the structures under investigation. Four syntactic structures, each consisting of four grammatical sentences, are as follows: sentential subjects, relative clauses, noun compounds and embedded questions, each of which is in italics in the following sentences:

SS: *That oil prices will rise again this year* is certain.

RC: The theory *we discussed yesterday* will be on the exam next week.

NC: There is a good possibility *that we can obtain the information elsewhere.*

EQ: The dorm manager asked me *who I wanted to have as a roommate.*

There are four items in each of these structures and the subjects are asked to use a 1 to 5 Likert scale which tells us if they accept them as grammatical.

In addition, there are ten *wh* questions as distracters because we do not want the subjects to know all the *wh* questions are unacceptable in some way.

To eliminate the ordering effect of the test two versions of the same test with two different orders are devised. To avoid the boredom which is very common in such tests we reversed the order of the first version, version A; that is, item 1 in version A became item 62 in version B and the reverse. Moreover, in order to skip the difference between *who* and *whom* the subjects were informed that *who/whom* distinction is not concerned in the test.

The 62 items of the test are divided in the following sub tests, this is accompanied by the 13 item structure dependency sub-test:

Subjacency

Extraction from the sentential subjects: 5 items

Extraction from the noun complements: 5 items

Extraction from the relative clauses: 5 items

Extraction from the embedded questions: 5 items

ECP

Extraction of the subject of the embedded question when *that* is deleted: 5 items Structure .

Syntactic test

Sentential subjects: 4 items

Relative clauses: 4 items

Noun complements: 4 items

Embedded questions: 4 items

Correct wh questions: 10 items
Cluster Sub-test

In addition for the structure dependency sub-test

we had 14 items, 6 of them were distracters and from the 8 relevant structures the first 5 items which were correctly understood by the subjects were counted for, since some subjects used other forms of question formation which were irrelevant to the purpose of the test, some used *wh* question words which made the answers useless for our purpose.

Discussions, Conclusions and Implications

Correlations

We found a negative correlation between onset age as an independent variable and the five structure types which are instances of UG violation (TTE, EQ, SS, RC and NC) indicating that the increase of onset age has an adverse effect on the competence of the second language learners in this study at least

with regard to these structure types. That the level of significance for all these correlations is .01 clarifies how negative this effect might be. In addition, it can be inferred that the negative effect of the increase of onset age is irrespectable of the kind of structure. This is also true for the relationship between onset age and the other two sub-tests: Cluster and Structure Dependency. However, the correlation between structure dependency and cluster sub-test and NC is significant only at .05 level of significance. The following figure will illustrate how the increase of onset age negatively affects the total scores of the subjects on the five structure types, the range of onset age is between 3 to 38 and that of the total scores is between 25 to 125:
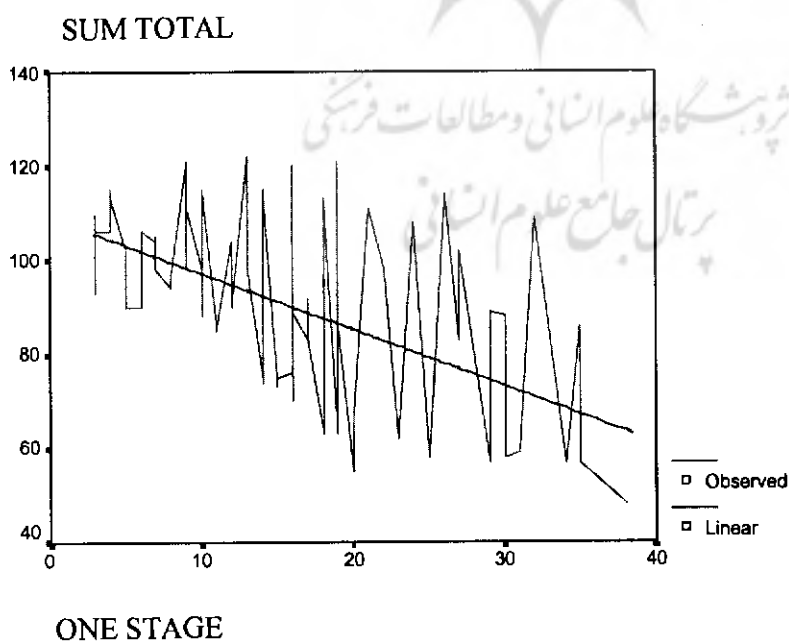
SUM TOTAL

ONE STAGE

Figure 1. The negative effect of the increase of onset age on total scores

Also it was found that the increase of onset age has a negative effect on both kinds of violations: Parametrically Varying and Invariant violations. Naturally, the case is also the same for the sum of violations, which comprises the five structure types. Here we can conclude that in addition to structure type, the violation type also makes no difference in the way the subjects deal with the UG violations. The older learners can not detect the violations as properly as the younger ones whether the kind of violation is considered so in their own mother tongue or not.

The general expectation is that they should perform worse in parametrically varying violations and better in invariant ones. The two means (47.98 and 59.10 respectively) indicate that this tendency exists; that is, when they follow a different parameter in their L1 it is much harder for them to switch the parameter in L2 (cases of this kind in this study are TTE, extraction from EQ with 15.15 and 16.86 as means respectively), while when they follow the same parameter in both languages the detection of the violation of the related parameters is much easier (cases of this kind in this study are extractions from SS, RC and NC with 19.71, 20.05 and 19.32 as means respectively).We will see that the kind of violation and the type of structure both are effective in the way the subjects treat with them. Although, statistically speaking the

negative correlation is significant at .01 level for all these variables.

Variability within the Groups

Another point which is worth mentioning based on the descriptive results of the total scores for the four groups is that the second and the third groups have higher standard deviations (8.38, 16.87, 22 and 7.97 for groups 1, 2, 3 and 4 respectively) and as a result they enjoyed higher variances implying that the variability is higher in these groups. The third group has the highest standard deviation. This issue has theoretical and pedagogical implications which will be dealt with in the following sections.

UG Violations: Varying and Invariant Violations

As the results of one-way ANOVA indicates group has an important effect on the performance of the subjects, Sheffe-test results show where the difference is: only group 1 performs like group 4 meaning that the first age group, 3 to 9, responds like native speakers, group 1 and 4 are different from groups 2 and 3 rejecting the null hypothesis and confirming that older learners lag behind in detecting the violations. Since groups 2 and 3 are not different we can infer that with the start of the second decade the decrease in the subjects' ability to access UG occurs. The total score here refers to the combination of the five structure types (TTE, EQ, SS, RC and NC).

Therefore, generally speaking we can

conclude that *younger is better*, even postponing L2 acquisition to the second decade of life might be harmful, at least as far as the structures under study are concerned. A point which is worth mentioning here is that these subjects have been in L2 environment at least for five years and have enjoyed a rich input, still they lack some basic kind of knowledge in L2, one might imagine how deteriorating the effect of the increase of onset age can be when learners are learning L2 in an artificial environment with deteriorated and insufficient input.

Another crucial point of discussion is that it is not important whether you call this knowledge UG or something else and also it does not matter how you justify this knowledge and what approach you choose in dealing with these violations, the simple point is that the older learners can not detect erroneous sentences while the younger ones easily can.

Varying vs. Invariant Violation Types

In this section, the kind of violation is analyzed in details, as we mentioned before the two means 47.98 and 59.10 for varying and invariant violation types respectively show that the subjects feel more relaxed in detecting the invariant violation type since they can bring the knowledge from their L1. Extraction from SS, RC and NC are all considered violations in Persian too. The following figure shows how the four groups differ with regard to the five structure types.
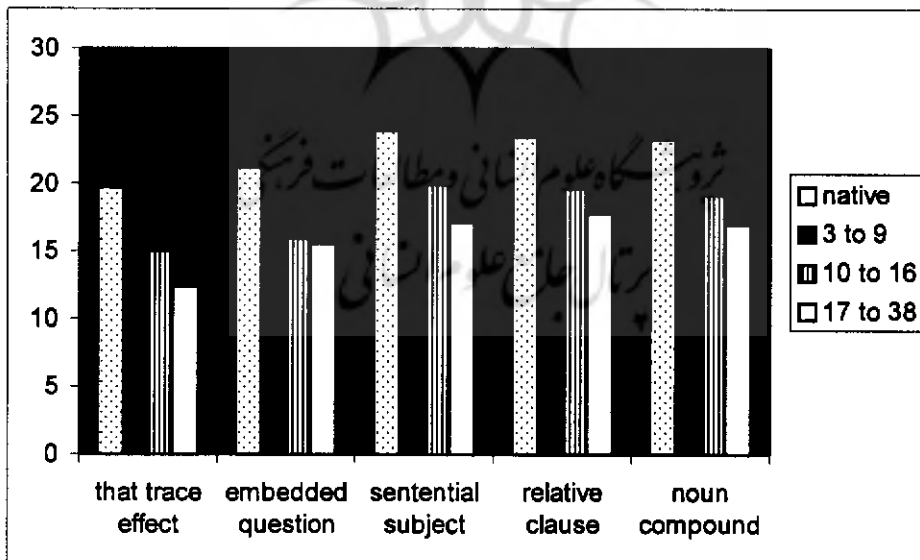

Figure 2. Means of Each UG Violation Type in the Four Groups

While TTE and EQ, instances of varying violations, are hard to grasp since they should switch the parameters, the Persian translation of these structures are quite acceptable. For the four groups the scores of varying violations are lower than the ones on invariant violations. That the scores are lower for the three age groups is not surprising but "how can we interpret the scores for the native speakers?"

The point is that the native speakers do not agree unanimously about unacceptability of instances of That-trace Effect; many of them do not consider them as unacceptable as instances of extractions from SS, RC and NC. To a lesser extent the case is true with extractions from EQ, here also the native speakers are not so determined about the unacceptability of extractions from EQ. The mean scores for the fourth group, the native speakers, on the five structure types: TTE, EQ, SS, RC and NC are 19.75, 21.20, 24.00, 23.50 and 23.30 respectively. As you see the scores for TTE is the least and EQ is the second least detected violation, that is why even for native speakers the sum of scores on varying violations is lower than the sum of scores on invariant violations.

The results of Repeated-measures ANOVA indicate that both violation type and age group had significant effects on subjects' scores.

However, the interaction of age group and violation type is not significant. Sheffe-test results for this interaction indicates that group 1 is different from groups 2 and 3, also group 4 is different from groups 2 and 3 but not from group1 as it is expected. It can be inferred that the first age group performs nearly as good as native speakers since both are different from groups 3 and 4. However, groups 2 and 3 do not perform differently at one hand and on the other hand, they are both different from the native speakers and the first group.

Two separate one-way ANOVAs were conducted to show how different the two groups are on each of the violation types. The results from both showed that the groups are different but the pattern of difference is the same for both violation types; that is, for both types group 1 is different only from group 3; however, group 4, which is not different from group 1, is different from groups 2 and 3 implying that group 2, which is not that different from group 1, can not perform as well as the native speakers. Referring to the differences for the total scores including varying and invariant violations, we see that group 2 is different from both group 1 and the native speakers. The reason is that when you add the two violation types the differences are magnified. Therefore, the general conclusion is that since in L2 learners encounter both violation types even the learners whose onset age passes the second decade of life do not

enjoy the same competence in L2 as first-decade learners. The latter are in the best position to learn L2 in a manner very close to the native speakers.

Five T-tests for the total number of L2 subjects and the four groups were run to see if they deal with the sums of varying and invariant violation types differently, the results showed that PLESL altogether and the four groups had different treatments about the two violation types, the differences were significant. Since the mean scores for varying type is lower for PLESL altogether and the four groups we can infer that invariant violations have been easier to detect. The implication of these results for the PLESL might be that varying violations are harder to detect since they have to switch the L1 parameter to L2 parameter and invariant violations are easier since they follow the same parameter in both languages.

Varying Structure Types

In this section the two structure types of varying violation type are discussed. Repeated-measures ANOVA indicated that structure type and age group both have significant effects on the performance of the three groups. Here group 1 is different from group 3 only but group 4 is different from groups 2 and 3 implying that although group 2 is not different from group 1 it can not perform as well as the native speakers, again

resulting in the fact that even those second language learners who start L2 learning after the second decade can not enjoy the same range of abilities as the native speakers and the first-decade learners.

One-way ANOVA for the four groups about the two structure types TTE and EQ showed group differences. Group 1 is only different from group 3 in both TTE and EQ; however, group 4 is different from groups 2 and 3 in both TTE and EQ implying that although group 2 is not different from group 1 it can not perform as well as the native speakers, this shows that the second-decade learners are incapable of matching with the native speakers at least with regard to these two structure types.

In order to see if the two structures are treated differently by the PLESL altogether and in each of the four groups five T-tests were conducted. The results indicated that for the total number of L2 subjects these two structure types are treated differently, scores for TTE are lower; for groups 1 and 2 the scores on the two structures are not that different, the difference is not big enough to make a significant statistical difference. However, the case is different for groups 3 and 4, in both groups structure type makes a difference, in both scores for TTE are lower.

Two interpretations are needed when dealing with these two groups, in group 3 the late language learners could not detect the UG

type violation in TTE possibly since it is not considered a violation in their L1 and it is lower than EQ as it is the case with the four groups. The native speakers could not detect TTE because of the general disagreement among the native speakers on TTE, not every native speaker considers it bad, most of them believe that there is something wrong with the examples of TTE but it is not considered as unacceptable as for example extraction from Sentential Subject but for the native speakers extraction from EQ is considered bad, though figure 6 shows that still it is less detected compared with the invariant structures. It is very difficult to decide if the lower performance of L2 learners as to varying structure types is rooted in their L1 and the difficulty of resetting the parameter or like L1 learners of English they are following a general linguistic tendency in the way they treat the two violation types.

The four groups follow a similar pattern as to the two varying structure types, TTE and EQ. However, for the four groups we have lower scores for TTE meaning that it is a less detectable violation though the interpretation might be different for the native speakers and the three groups of L2 learners. Group 3 performs much better as to EQ violation compared with TTE. Hence, T-test results showed that for groups 3 and 4 the two structures are treated differently.

Invariant Structure Types

The descriptive data show the scores on the three invariant structure types, extractions from SS, RC and NC, in the four groups. The three invariant violation types are most detectable for the native speakers and least detectable for group 3, groups 1 and 2 are second and third in the order. Figure 2 gives more information as to how each group deals with the five structure types from the two violation types. The two varying structure types were discussed in the previous section. In this section, we focus on the three bars on the right in the figure. For the native speakers and group 2 extraction from SS is the most detectable violation but for groups 1 and 3 extraction from RC is the most detectable. Extraction from NC is the least detectable for the four groups.

The results of Repeated-measures ANOVA for the four groups on the three invariant structure types indicates that only age group differences were significant and structure type and the interaction between the structure type and the age group is not. Results of Eta Squared show that age group has the greatest effect and structure type and interaction are second and third effective respectively. Sheffe-test results in Table 31 reveal that group 1 is not different from groups 2 and 4; group 4 is different from groups 2 and 3 implying that even group 2 can not perform as well as the native speakers. Although group 1

is not different from group 2 and group 3 also is not different from group 2, group 1 is different from group 3 because the differences between groups 1 and 3 become great enough to be statistically significant.

Three one-way ANOVAs were conducted for each of the three invariant structure types. Sheffe-test results shows a uniform pattern in the way the four groups dealt with each of the invariant structure types; group 1 is not different from groups 2 and 4; group 2 is not different groups 3 and group 4 is different from both groups 2 and 3group 1; however, it is different from group 3, as it is expected the differences between group 1 and 3 become great enough to be statistically significant.

Then five separate Repeated-measures ANOVAs were conducted for total number of PLESL and each of the four groups to check if for the PLESL altogether and in any one group subjects performed differently with regard to the three invariant structures. Neither in the total group nor in any one of the groups the structure type made a significant difference (that is why we did not run Sheffe-test here). A gradual decline is seen from the native speakers as the control group to groups 1, 2 and 3 as the second, third and fourth capable group in effective detection of the violations.

The general conclusion here would be that irrespectable of the kind of structures in the invariant violation type, the gradual increase

of the onset age of second language learners declines even in a natural L2 environment.

Structure Dependency
Since in Persian formation of interrogative is either through intonation or by adding "aya", we wanted to see if the subjects with different onset ages were able to observe structure dependency in English.

Analysis of Variance and the resulting Sheffe-test revealed that the groups are different as to their responses to the required task in Structure Dependency sub-test, group 1 is not different from groups 2 and 4; however, groups 1, 2 and 4 are different from group 3 implying that after the age of 16 the subjects even find instances of structure dependency difficult to grasp, of course possibly this shortcoming would be eliminated if they were taught explicitly about the issue.

A second important point about the Sheffe-test results is that group two is different from group 3 as groups 1 and 4 are, implying that those starting L2 in the second decade of life might not encounter much difficulty in dealing with instances of structure dependency while late learners who start L2 after 16 will most probably face difficulties even in rudimentary aspects of UG.

Cluster Sub-test
As it was mentioned in sections dealing with the test and the test format Cluster sub-test

was developed as distracters and as a separate sub-test with 11 sentences since it comprises violations, which are of UG type, and they are not taught explicitly in L2 learning classes, again they were tested on a 1 to 5 Likert scale. ANOVA results showed a group difference as to Cluster sub-test. Sheffe-test results revealed that groups 1 and 4 are significantly different from group 3; however, group 1 is not different from group 2 while group 4 is different from group 2 implying that group 2 is not different from group 1 but it can not perform as well as the native speakers, still it lags behind. This sub-test is not a main part of the test and it can not be given that much credit since here we have only one item of each violation type since as we mentioned earlier the main purpose of including this sub-test is something else it is first important as distraction.

Summary and Conclusion

Generally speaking, the results of the study show a very powerful effect of the increase of onset age on the ability of the learners to detect UG violations. In addition, group differences were also important in that group 1 always performed as well as the native speakers; group 2 could not perform as well as the native speakers in most cases: in detecting total violations, varying violations, invariant violations and cluster sub-test ; group 3 failed to perform as well as the native speakers and

group 1 in any of the issues under investigation. Group 3 could not perform as well as even group 2 in structure dependency sub-test. We can conclude that (a) the ultimate level of attainment depends in part on the age (b) there are sensitive periods controlling language development during which the acquisition of different linguistic abilities is fruitful and after that language learning becomes irregular and incomplete (c) the age-related loss in competence is cumulative and there is no cut off point (Long 1990). The deterioration in some learners occurs as early as the beginning of second decade of life. The capacity for language development is maturationally constrained (Johnson and Newport 1991).

Another conclusion of this study is that since late learners did not perform as well as the native speakers on both violation types we can infer that age of acquisition affects both varying and invariant UG type knowledge. Late learning damages the acquisition of both; however, detecting invariant violations seems easier since they do not have to switch the L1 parameter to L2 parameter while for varying violations this might be one possible justification for their relatively poor performance.

As to the structure types, the two varying structure types, TTE and extraction from EQ, were treated differently in groups 3 and 4 while for groups 1 and 2 this distinction did not exist. The three kinds of invariant structure types, extractions from SS, RC and NC, were not treated differently in the four groups implying that irrespectable of

the kind of structure, the late learners performed poorly compared with the native speakers and the first group.

The higher variability of groups 2 and 3 compared with lower variability of group 1 and the native speakers confirms that the late learners have diverse approaches in dealing with UG violations. Native speakers are very unanimous in their responses and group 1 is very similar to the native group; groups 2 and 3 have higher variability than group 1 and the native group and group 3 show the highest variability in the order.

Implications of the Study
The implications of this study are twofold: Theoretical and Pedagogical.

Theoretical Implications
Lenneberg (1967) hypothesized that language could not be acquired after a critical period, extending from infancy until puberty. His hypothesis was mainly aimed at L1. This study tried to check if the nature of hypothesized critical or sensitive period extends to second language. Both correlation and ANOVA results demonstrated a clear and strong advantage for early learners over the late learners. The effect was also appeared to be effective in every structure type and the two violation types under investigation. The results support the conclusion that a critical period for language development extends its

effects to second language development too. The present literature supports a superiority for subjects who begin L2 learning earlier (Patkowski, 1980). Late learning adversely affects accessibility to UG type knowledge (Johnson and Newport, 1989; Long, 1990). Even those who appear to achieve a native like competence nevertheless differ from native speakers in subtle ways (Schachter 1989).

Even those scholars who do not confirm the strong version of critical period (White & Genesee, 1996) agree that younger learners are more likely to achieve native like proficiency. Weakening of innate linguistic constraint or loss of UG is one possible cause of these age effects but it is not the only one. The decline might also be justified by other factors.

A very important implication of the study is the highest variability of the third group and considerable variability of the second group implying that late learners approach L2 through different routes.

Pedagogical Implications
The main pedagogical implication of this study and studies with similar results is that to achieve native like competence SLA should start as early as the first decade of life; the decision about a very precise age of onset needs a lot of further research and depends on plenty of other factors. The fact that native like competence is attainable at later ages does not mean that it is always so, or that

attainment of native like competence is typical in late learners (White and Genesee 1996). In other words, adult learners are often less successful than younger learners. If late learning in a natural environment can not typically reach native like competence let alone the L2 learners in an unnatural classroom setting with poor, deviated and insufficient input.

The higher variability of the third group and the fact that they go through different routes in learning L2 implies that we can not provide them with an identical teaching method. They may use different faculties of the brain apart from linguistic faculty or at least in addition to the innate linguistic faculty.

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