Age and Other Variables Affecting Rate of Learning

in Adult Foreign Language Acquisition

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Abstract

This study investigated the effects of age and other individual factors in the rate of learning of two groups of adult learners of English as a foreign language. Participants were 65 Catalan-Spanish bilinguals with L2 French, who started learning English as an L3 after 18 years old. One group (*N*=51) had 200 hours of instruction, and the other group (*N*=14) 416. Participants took four tests: a cloze, a dictation, a grammar multiple choice test and a listening comprehension test. In correlation analyses, no general relationship between age and test scores was observed. When data were disaggregated for Group A, a t-test comparing two sub-samples with a cut-off point set at 24 years old yielded moderately significant mean differences in the listening scores, favourable to the younger age group. Another three variables yielded moderately significant correlation coefficients for Group A. Stepwise regression analysis reinforced the role played by L1 literacy and proficiency in previous foreign language, while excluding motivation. For Group B, only motivation reached a strong positive correlation with dictation and listening scores. Results suggest that in formal L2 contexts, variables affecting the learning rate of adults may vary as the student progresses towards ultimate attainment. Pedagogical implications and suggestions for further research are discussed.

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1. Introduction

1.1. Adult Second Language Acquisition: A Myriad of Factors

'Adults are not a homogeneous group of linguistically incompetent creatures', Marinova-Todd, Marshall and Snow (2000:18). With such strength and conviction Marinova-Todd et al. express their utter disagreement with what they consider the misemphasis that previous research has placed on unsuccessful adult L2 learners, due to a false assumption drawn from unsuccessful learners' evidence by which the totality of adult learners would be incapable of native-like attainment in L2 acquisition.

Previous research has claimed that paying attention to the different factors that play a role in adult second language acquisition[1] is critical to the understanding of post-pubertal second language learning processes. Hyltenstam and Abrahamsson (2003:578) make a call 'for further research to systematically identify and describe the social/psychological characteristics that can be associated with the near-native adult learner'. Dörnyei and Skehan (2003) suggest that learner differences in adult SLA should generate more interest. Birdsong (2006:29) admits that while there may be a cognitive decline across adulthood, this decline will show 'a range of variation among individuals', and that that variation 'should play out in L2A as interindividual differences in ultimate attainment'. The role of age as well as of some of those factors or individual differences and how they impact on the second language acquisition rate of adult learners in a formal learning context is the focus of the present empirical study.

The first variable that will be explored is age, as well as the role it plays in different learning settings.

In their 1989 seminal paper on critical period effects on second language acquisition in naturalistic settings, Johnson and Newport laid the ground for a case

which is still being debated nowadays: when they looked at the potential effects of age of acquisition before adolescence as opposed to its effects after adolescence, maturational effects were found. In their study, the ability to learn a language declined slowly during maturation, to 'plateau at a low level after puberty', (p. 90). After this window of opportunity, a high degree of variability among individuals should be expected, during which the variable age does not have a predictive value any longer. DeKeyser supported this concept of discontinuity of age effects in 2000, in his study on 57 Hungarian-speaking adults who had immigrated to the US and lived in Pittsburg for a minimum of 10 years, although limiting the maturational effects to implicit learning mechanisms.

On the other side of the fence, in 1999 Bialystok and Hakuta conducted an analysis of the New York population census in 1990. In their study, a linear decline in proficiency was observed across all ages, and not a sharp end to learning after puberty. Results along the same lines were found by Birdsong and Molis in 2001, in their replication of the Johnson and Newport 1989 study, by using the same research methods and materials. A cut-off point between early and late arrivals was set at age 17. In this replication, a strong age effect was observed for those subjects who were in the late arrivals group, $r=-.67$, $p<.0001$. This linear decline was not observed for the other groups. Again, these results were not consistent with a maturational explanation of age effects.

In summary, for post-pubertal learners in naturalistic acquisition settings the Critical Period Hypothesis postulates that a qualitative change occurs at a particular point in the maturation of the individual (Singleton and Ryan 2004:100), with the following consequences for the learning of languages: a) post-pubertal L2 learning will be more effortful; b) different learning mechanisms underlie L2 learning, and c) L2 learners cannot attain native-like levels of proficiency (for a complete literature review on the Critical Period Hypothesis, see Singleton and Ryan 2004). In their extensive review of the literature in the field, Singleton and Ryan (2004) provide both empirical evidence and counter-evidence to each one of the propositions above, ultimately advocating that the

alleged age differences are more likely to be differences in the learning situation, quality of input, and other factors which tend to occur simultaneously with age than to maturational factors. It is significant, to say the least, that after one hundred pages of Critical Period Hypothesis literature review, Singleton and Ryan (2004:115) finish by agreeing with MacLaughling (1978, as cited in Singleton and Ryan, 2004) in that 'age differences between adults and children are of little significance as far as the L2 acquisition process is concerned', and that children and adults alike approach L2 acquisition by using the same strategies. Marinova-Todd et al. (2000) reach a similar conclusion in their critical study when they state that

> 'age does influence language learning, but primarily because it is associated with social, psychological, educational, and other factors that can affect L2 proficiency, not because of any critical period that limits the possibility of language learning by adults.' (p. 28)

When we move on to formal learning contexts, Muñoz (2006) warns the reader against the dangers of equating age of onset in naturalistic contexts with age of instruction in formal learning settings, given that in the latter, the main condition for acquisition, massive L2 input, is not met. In formal learning settings, successful L2 learning is only possible provided significant exposure to the language is guaranteed. Therefore, it makes no sense to talk about constraints for adult learning passed the window of opportunity if it is significant exposure rather than age what plays a role in language acquisition; rather, it may be more meaningful to explore whether the aging process in general limits the adults' capacity for language learning in any manner.

Also working in formal learning contexts, Seright (1985) investigated the relationship between age and aural comprehension in adult learners of English. By using a matched-pair samples method, she found 'a significant negative relationship between learner age and aural comprehension achievement in adults' (p. 465), which she suggests may be partially attributed to the loss of auditory acuity and an increased reaction time to stimuli, both factors involved in aging.

The main aim of the present study is to explore whether a sample of adult learners of English as an L2 shows age effects, and to reflect on possible reasons. Unlike previous studies which have focused on a particular skill or test, this piece of empirical research will provide insights into the different language skills, as the existing data allow for the investigation of the relationship of age with four different language test scores.

In addition to age, there have been a number of other variables which have been identified in previous research as having an influence on the performance of adults acquiring a second language. The choice of participants in the present study permitted the analysis of some other such factors. The second biological factor explored was sex. Motivation was included as an affective factor. Only one socio-cultural factor could be taken into account: Tertiary education. Finally, several linguistic factors were considered: Years of study of previously learnt languages, proficiency in previously learnt languages, previous year English grades, and L1 literacy.

The second aim of this study will be to elucidate which of the abovementioned factors impact the rate of our adult learners' acquisition of English as an L2, and to what extent. Only a few previous studies have investigated the factors playing a role in rate of learning in formal learning contexts (Seright, 1985; Brown ,1983, as cited in Seright, 1985) . The current study may yield interesting results as it explores biological, affective, socio-cultural and linguistic variables at two different stages of the learning process: after 200 hours and after 416 hours of instruction.

Concerning the second biological variable, sex, research findings are controversial, although current research 'indicates that there is indeed a processing difference between males and females and that this processing difference exists in both L1 and at least in highly practiced L2', Wood Bowden, Sanz, and Stafford (2005:114). According to their review of findings, the prediction is that women will show an advantage compared to men during the initial phases of SLA (for a review of the declarative/procedural model in relation to sex, see Wood Bowden

et al., 2005). This variable has received very little attention in research, very possibly due to a perception of political incorrectness.

Motivation has been reported to be one of the big individual affective factors accounting for variance in adult learners' scores; according to Ellis (2004:536), 'the second of the "big two" individual factors, accounting for only slightly less of the variance in learners' achievement scores than language aptitude'. Moyer (1999:98) reports on only one exceptional learner in her study on ultimate attainment on phonology performing within native speaker controls because, while all the rest of participants on her study had an instrumental orientation (career oriented), this exceptional learner showed an integrative orientation, expressed as a 'strong desire to acculturate', as well as feeling a personal fascination with the target language and culture.

Tertiary education is the socio-cultural variable in our study which is closest to what Bialystok and Hakuta operationalised in 1999 as years of schooling.

Finally, this study investigates the variable L1 literacy and its impact on subsequent languages (Lns) learnt later in life. Bialystok and Hakuta make a call for further research on this topic in their 1999 very influential study using New York census data. In this study, schooling, operationalised as years of formal education, was positively correlated to L2 proficiency. In their study on Korean learners of English differing in age of arrival, Flege, Yeni-Komshian and Liu (1999:78) interpret the differences in scores testing rule-based English morphosyntax as a function of the amount of education received by participants. Wood Bowden et al.'s 2005 review of the empirical research on experienced language learners includes a study by Swain, Lapkin, Rowen and Hart (1990, cited in Wood Bowden et al., 2005) which investigates the impact of L1 literacy on L3 French in Canada. The results of the study suggest that successful L3 acquisition is highly influenced by the development of L1 language literacy skills. In his Developmental Interdependence Hypothesis, Cummins (1980:118) proposes that 'the level of L2 competence which a bilingual child attains is

partially a function of the type of competence the child has developed in the L1 at the time when intensive exposure to L2 begins'. Returning to the opening lines in the introduction, you will remember the key word in the citation: homogeneous. The Developmental Interdependence Hypothesis was formulated in the context of children; but in an adult context, why should it be taken for granted that all the students in a classroom share the same level of L1 literacy development? And, if, as many teachers and educators have pointed out, they are aware of their group heterogeneity in this respect, would it not be a fair expectation that the different L1 literacy levels lead to different rates of learning, or even to different outcomes in the students' learning of their L2? The availability of L1 test scores for the participants in the present study allows for the exploration of such questions.

This empirical study addresses two research questions:

Does age of first instruction have any relationship with rate of acquisition of English as an L2 after 200 hours of instruction and/or after 416 hours of instruction for adult learners in a formal learning context?

What other factors play a role in rate of acquisition of English as an L2 after 200 hours of instruction and/or after 416 hours of instruction for adult learners in a formal learning context? For this research question, the author hypothesizes that L1 literacy will be the variable which will show the highest contribution to rate of learning.

2. Method

2.1. Description of Participants and Research Design

Participants in this study belong to one of the four groups of participants which constituted the subject pool of the Barcelona Age Factor Project[2], a research project undertaken by the University in Barcelona which explored age effects on the learning of English as a foreign language in Catalonia, Spain. For

this paper, learners whose age of first instruction in English instruction is 18 or older have been selected. The original adult sample had 135 subjects. The impact of participant mortality in this age group was high, and therefore more than half of the participants who were tested at Time 1 did not take the test at Time 2. Conversely, many of the participants who were tested at Time 2 had not been tested at Time 1. Comparisons are possible because this study looks at the different learning rates of participants cross-sectionally: learners are compared within Time 1 and within Time 2, but the learning development between Time 1 and Time 2 is not analysed.

In the BAF Project these subjects were classified based on their extracurricular tuition and exposure in English together with the other age groups. As the design was based in a comparison between the different age groups including children and adolescents, the criteria that were used to operationalise extracurricular tuition and exposure could not be used just as they were, since our study aimed at a comparison within a group of adults exclusively. A higher level of detail was needed. For this empirical research, learners have been matched for other languages previously learnt, for short periods of earlier instruction in English, and for exposure to English.

The first factor that could influence learning rate was the role played by any other foreign languages participants had previously learnt. Our subjects are Catalan-Spanish bilinguals with different degrees of language dominance, so for the participants in this study English could be their L3[3] in the case that they had learnt another foreign language at school, or their L2 in the case they had not been taught another foreign language. Initially, the expectation was that both scenarios would be present in the participants. However, a close analysis of the biographical data showed that, because of their age, nearly all of them had had French as a second language, either during primary school alone, or during primary school and secondary school. The teaching of French in the mainstream curriculum was very common in Spain until the end of the 1980s, so all our subjects had been exposed to it to some degree. A methodological decision was taken as a result:

participants who reported not having been taught French at primary or secondary school were removed from the study. In addition, and to further strengthen the internal validity of the study, all the learners in the study have been taught French for a minimum period of three years.

There were learners in the BAF project who could be considered as *false starters* (my italics). Those subjects had enrolled in an English course at some point in their lives and had abandoned the course during its early stages for some reason or other. In some cases previous instruction had been as minimal as two weeks of private tuition, or two weeks in a low-level intensive course. However, and to strengthen the methodological rigour of the study, none of those learners was included in the study. For all participants who were included, their age of first instruction is the age at which they received instruction in English ever.

The last variable that needed to be controlled was exposure to English. Even though there was a noteworthy number of participants who had never been to an English-speaking country, the possibility that participants had spent brief periods of time in English-speaking countries for learning, work, or pleasure was very high, considering that many of the participants were over thirty years old. Therefore, the selection was fine-grained to include only those subjects who had spent a maximum of four weeks in an English-speaking country in their entire lives, consisting of short stays of one or two weeks maximum, and who had not had English instruction or lived with a host family during the time they were abroad. In two words: leisure travel.

After data trimming, our adult sample was reduced to 65 subjects, ranging from 18 to 47 years old. Students were tested twice, after 200 hours of instruction and after 416 hours of instruction. Participants were grouped according to the hours of instruction received. Group A (200 hours of instruction) included 51 subjects, with a mean age of first instruction of 27.51, SD=7.56. Group B (416 hours of instruction) included 14 subjects, with a mean age of first instruction of 25.93, SD=8.00.

2.2. Instrumentation: Tests and Questionnaires

The original BAF project used an extensive battery of tests to assess the participants' performance in the different language subcomponents. Unfortunately, not all tests have been considered in the present study: as all of them were designed to test subjects of different age groups, including children and adolescents, sometimes their scoring methods did not discriminate enough when looking at one age group alone. Such tests could not be included in the research.

The battery of tests used in the BAF project is described to a high level of detail in Muñoz (2006:16). The tests chosen for this research study were: first, the cloze test in English, consisting of a text with 30 gaps, distributed so that a gap would be found every ten words approximately. This test was cognitively demanding, as it tapped on students' pragmatic, grammatical, lexical and contextual knowledge. Secondly, the dictation test in English, consisting of fifty words that were dictated to participants divided into ten segments which had to be written on ten different pre-drawn lines. This was considered a pragmatic text too measuring overall ability in English, with the advantage of including a listening comprehension component. The standardized English grammar test, organised in multiple choice format, was selected too. It consisted of 50 items with three different alternative answers each. The test was the English-Second Language Placement Test, by Donna Ilyin, Jeannette Best and Virginia Biagi. Finally, the listening comprehension test involving a picture matching task was used as well. Thirty items were presented to the participants in an increasing order of difficulty. Participants were expected to match the pictures to the words or utterances that were spoken to them. Finally, participants had to take a dictation and a cloze test in Catalan and in Spanish, with the objective of measuring their overall level of proficiency in their L1s.

The questionnaires were administered either in Catalan or Spanish, at the participant's choice. They contained different types of questions: biographical information concerning previous experiences related to English learning; questions on English learning habits and strategies, and, finally, questions on

orientations and attitudes towards learning English. All the independent variables included in this research were drawn from the questionnaires, except for the L1 literacy variable which was the result of a combination of L1 test scores, which will be explained later on.

A correlational research design will be used in order to explore the relationships between the dependent and the independent variables, a design which has often been used in previous research in the area of individual differences (see Ellis 2004:526).

2.3. Terminology and Operationalisation of Variables

The first variable that will be considered is age of first instruction, expressed in years. This was one of the biographical data which was extracted from the questionnaires, in which participants were asked to report whether they had received instruction in English at all before enrolling in their current courses. For the subjects who were included in the sample, age of first instruction is the result of subtracting the year when they began their formal instruction in English from the year they were born. In other studies, this variable has been named age of acquisition (AoA), age of onset (AoO) or age of exposure (AoE). Age of acquisition is defined by Birdsong (2006:11) as 'the age at which learners are immersed in the L2 context, typically as immigrants,' and it is used in the Johnson and Newport 1989 paper and by DeKeyser in his 2000 article. A very similar definition would apply to the term age of arrival (AOA), which refers to the age at which immigrants arrive in the host country. This term is used by Flege et al. (1999:78), Birdsong and Molis (2001:237), and Bialystok and Hakuta (1999:169). As a matter of fact, both terms are often used interchangeably in the literature in naturalistic learning settings. In this paper, the age variable ought to reflect the formal learning context to which our participants belonged. We considered the term age of first exposure (AoE), which Birdsong (2006:11) states 'can occur in a formal schooling environment, visits to the L2 country, extended contact with relatives who are L2 speakers, and so forth'. However, this definition still involved substantial exposure to the L2 outside of the school environment, which

was not the case for our participants. As Muñoz (2008:585) puts it, studies carried out in foreign language learning situations use as starting age the age of first *insignificant* exposure (my italics), where the school setting is usually the only contact with the language that the student has. Therefore, the term chosen for this study is age of first instruction (henceforth AFI), to indicate that the learner is only exposed to the L2 in the classroom, having few opportunities to interact with native speakers of the L2 outside the classroom environment. Moyer (1999:87) also used this name with the same meaning for this variable, age at first instruction, to differentiate it from age at first immersion. The second biographical variable which was taken into account was sex as reported in the questionnaires.

Regarding variables related to the learning of other foreign languages, it has already been mentioned that all subjects included in the study had a minimum of three years of instruction in French. However, there was a high level of variability among subjects as regards the number of years of instruction they had received, ranging from three years in primary school to twelve or fourteen years if participants had been educated in bilingual French schools. Therefore, it was decided to include years of study of previous foreign language as an independent variable. Another variable related to the learning of other foreign languages which was eventually included in the design was previous additional language proficiency. In the questionnaires, subjects were asked to report the grades they had obtained in the last year of study of French. Although this variable needs to be treated with caution because it is a self-reported measure, it seemed to add value to the study and therefore it was decided to include it in the list of variables.

As far as motivation is concerned, the questionnaires contained a self-reported measure, operationalised as degree of motivation to learn English in a 6-step Likert scale.

In addition, the inclusion of variables related to socio-cultural background and literacy was congruent with previous research (Bialystok and Hakuta, 1999; Flege et al., 1999; Cummins, 1984, as cited in Singleton and Ryan, 2004). The questionnaires contained several items which might have helped depict a socio-

cultural background picture, such as years of schooling or profession of the participants, or their parents' profession. Regrettably, there were too many participants who decided not to answer those questions, so the available answers could not be used. Another option was to split participants between those who had tertiary education and those who did not have tertiary education. That information could be inferred from the language schools in which they were learning English. In Spain, some language schools for adults ascribed to universities require that students are studying in a university to be able to enrol, while other schools do not have that requirement. In fact, it is a common complain from schools not having that requirement that the level of literacy of the students they have is very heterogeneous and they sometimes have difficulty in finding teaching approaches that balance those differences. Our variable tertiary education breaks down our participants into two groups: those attending schools which have that requirement and those who attend schools not having it. Again, this variable needs to be treated with caution: while being a member of a university is a requirement, this does not necessarily imply that the student has a degree; he or she can also be a first-year student. Hence, the accurate reading of the variable is: subjects which have completed secondary education successfully and who have accessed tertiary education, as opposed to those who may or may not have tertiary education, but are studying at a school for which this is not a requirement.

Lastly, a combination of L1 test scores available had to be used to define a variable which would measure the subjects' development of literacy in their L1. Bialystok and Hakuta (1999) had equated literacy with years of formal education, and they found a relationship between years of schooling and proficiency in the L2. In the current study it was not possible to obtain the participants' years of schooling, as many of them did not report them in the questionnaires. Nonetheless, subjects had been tested on their L1s' proficiency by means of a cloze test and a dictation, so we operationalised L1 literacy as the mean of the scores obtained in the two tests. At this point you will recall that our participants were Catalan-Spanish bilinguals. In the questionnaires, they were asked to report which was their dominant language, or whether they considered themselves

balanced bilinguals. Subsequently, the mean of the tests scores was calculated according to the participants' self-reported language dominance: for those who said they were dominant in one language, we calculated the mean of the two tests taken in the dominant language; for those who viewed themselves as balanced bilinguals, the mean was calculated by including the two tests in the two languages.

3. Data Analysis and Results

Results of the descriptive statistics for the dependent variables are shown in tables 1.1. and 1.2. Additional histograms with normality curves and Q-Q Plots to prove that data are normally distributed have been included in Appendix A. Finally, the test of Shapiro-Wilk, used for sample sizes smaller than 2,000 subjects shows all results close to 1, so the assumption of normality is met.

Table 1.1. *Descriptive Statistics for the Dependent Variables: Group A*

	Group A = 200 hours of instruction (N=51)					
	Maximum	Minimum	*M*	5% Trimmed M	*SD*	Shapiro-Wilk
English Cloze Scores	30	8	22,47	22,70	4,379	0,953
English Dictation Scores	48	17	35,04	35,27	7,678	0,968
Multiple Choice Scores	50	19	34,49	34,49	7,098	0,990
Listening Scores	88	36	59,84	59,65	12,340	0,982

Table 1.2. *Descriptive Statistics for the Dependent Variables: Group B*

	Maximum	Minimum	*M*	5% Trimmed M	*SD*	Shapiro-Wilk
			Group B = 416 hours of instruction (*N*=14)			
English Cloze Scores	29	24	26,36	26,34	1,447	0,919
English Dictation Scores	49	31	42,93	43,25	5,121	0,921
Multiple Choice Scores	49	34	42,57	42,69	4,536	0,927
Listening Scores	24	16	19,71	19,68	2,644	0,930

Outliers were found in the cloze (case 29 and case 47), and in dictation (case 29). Individual cases were checked and the low results were due to some participants scoring low in some of the tests for no specific reason. The decision was taken not to remove or transform them as 5% of the trimmed mean (reported above) is still very close to mean.

Finally, maximum scores and means were explored to check whether there were ceiling effects in any of the tests. As shown in Table 1.3, no ceiling effects were observed.

Table 1.3. *Test Results' Means and Maximum Scores*

	M Group A	*M* Group B	Maximum Score
English Cloze Scores	22,47	26,36	30,00
English Dictation Scores	35,04	42,93	50,00
Multiple Choice Scores	34,49	42,57	50,00
Listening Scores	14,96	19,71	25,00

3.1. Age of First Instruction Effects

The relationship between AFI and the results in the different tests was investigated for Group A using Pearson product-moment correlation. Scatterplots were generated to ensure that the assumptions of normality, linearity and homocedasticity were met. No correlation was found with any of the test scores. Scatterplots showing nearly flat regression lines are provided in Appendix B.

Because of the different results reported in the literature for the effects of age when data were aggregated or disaggregated, and taking into account that the age range of our sample was wide (18 to 47), it was decided to set a cut-off point to explore any relationships which might exist in smaller age groups. Also in a formal learning setting, Seright (1985:468) found performance differences in aural comprehension tasks in the 20-30 age range; Brown (1983, as cited in Seright, 1985) also reported younger adults (ages 19 to 23) scoring notably higher than older adults (ages 55 and above). Therefore, it was resolved to set the cut-off point at age 24. Sub-sample A.1 included learners ages 18 to 23, and sub-sample A.2 included learners ages 24 to 47. An independent-samples t-test was conducted to compare the test scores for sub-samples A.1 and A.2. There were no differences in the means in the cloze, dictation, or multiple choice tests. A significant difference was found in the mean scores of sub-sample A.1, M=16.26, SD=3.02, and sub-sample A.2, M=14.19, SD=2.90, in the listening test: t=2,435, p<.05. The magnitude of the difference was moderate according to the guidelines proposed by Cohen, 1988 (eta squared=.11). For Group B, correlations did not reach significance.

3.2. The Impact of Other Variables

Out of the rest of variables, two of them were dichotomous, and the other five were continuous. The two dichotomous variables were sex and tertiary education. The five continuous variables were years of study of previous foreign languages, previous foreign language proficiency, English grades previous year,

motivation, and L1 literacy. Therefore, they were submitted to different statistical analyses according to their scales.

For the categorical variables, a multivariate analysis of variance (MANOVA) was conducted. Preliminary tests to check whether the data conformed to the assumptions of Manova were carried out and are presented in Appendix C. Results of the analysis showed that Wilk's Lambda significance level for sex and tertiary studies was .54 and .64 respectively. In both cases this was higher than .05, so there were no significant differences between males and females and between subjects with tertiary education and subjects without tertiary education in Group A.

For continuous variables, the intention was to conduct multiple regression analysis. However, and to meet the sample size requirements of multiple regression analysis, which establish that a minimum of 15 subjects per variable is needed, this analysis had to be conducted on three variables only (15 x 3 = 45 and our sample size was 51). Since there were five continuous variables, individual correlations were performed to identify which variables were more likely to impact the test results.

First, the assumptions of normality were checked by generating histograms for each independent variable. Linearity and homocedasticity assumptions were checked for every independent variable by generating scatter plots. No correlation was found for the variable years of study of the previous foreign language (see Table 1.4). Moderate positive correlations were found for some or all test scores and the variables previous additional language proficiency, motivation, and English grades previous year; L1 literacy was the only variable standing out and yielding positive correlations with all four test scores.

Table 1.4.
Correlations -Pearson r
Group A

Variable	Cloze	Dictation	Multiple Choice	Listening
Years of Study of Previous Foreign Language (*N*=51)				
Previous Foreign Language Proficiency (*N*=45)	.47**	.40**	.31*	
English Grades Previous Year (*N*=50)	.45**		.49**	.33*
Motivation (*N*=51)	.28*		.32*	
L1 Literacy (*N*=51)	.47**	.39**	.39**	.34*

*p<.05, **p<.01

      The variables chosen for the multiple regression analyses will be the three
which show the strongest correlation coefficients, but for English grades previous
year. Despite the latter being moderately correlated with most test scores, it
seemed to have a too obvious relationship with participants' current year test
scores to provide any additional information to the regression model.
Assumptions met and scatterplots generated for each one of the regression
analyses to check the assumptions of normality and linearity are presented in
Appendix D.

Table 1.5.
Standardized Coefficients and Multiple Regression
Group A

Language Tests	L1 Literacy		Final Grade in Foreign Language		Motivation	
	Beta	Adjusted R2	Beta	Adjusted R2	Beta	Adjusted R2
Cloze Test	.474*	.207*	.365*	.316*		
Dictation Test	.307*	.211*	.400*	.141*		
Multiple Choice	.399*	.140*				
Listening Test	.348*	.101*				

*p<.05

Therefore, to a greater or lesser extent depending on the test, L1 literacy was the strongest predictor of variance in Group A of our sample of adult learners of English.

For Group B, correlations were conducted for all continuous variables and test scores. Only one of the independent variables reached significance in two of the tests: motivation, showing a strong, positive correlation with dictation $r= .54$, $n=14$, $p<.05$ and listening test scores $r= .57$, $n=14$, $p<.05$. No regression analyses were carried out due to the small size of the sample. It was not possible to conduct Manova for the two categorical variables, sex and tertiary studies, for the same reason.

4. Discussion

The answer to our first research question seemed negative: no general relationship was observed between age and our battery of test scores for either group (200 hours of instruction, and 416 hours of instruction). However, when Group A was broken down into two separate sub-samples by setting a cut-off point at age 24, moderately significant mean differences were observed in the listening comprehension test in T-test results (eta squared .11), scores being more favourable to the younger age group. Several researchers claim that different adult age segments perform differently: Seright, in her 1985 study examining the relationship between age and L2 achievement of adults, distinguishes two groups: young adults (17 to 24) and older adults (25-41). Singleton and Ryan (2004:211) make a case for a distinct group of learners with characteristics specific to their age: what they call the 'young-old category', comprising learners between 55 and 75. These divisions seem to suggest different underlying learning processes or mechanisms occurring in different age ranges in adulthood, related to the ageing of the senses and to biological constraints possibly confounded with individual differences.

In the present study, the different linguistic skills did not behave in the same way. This was already pointed out by Oyama when he stated that there might be different ends to the critical period for the different skills, 'critical age will differ for different levels of linguistic skill,' (Oyama, 1976, as cited in Singleton and Ryan, 2004:184). This is also consistent with the results of Flege et al. (1999:98), who interpreted their findings as lending support to the view that 'age constrains the learning of L2 phonology to a greater extent than it does the learning of L2 morphosyntax'. Another conclusion of the Flege et al. study is that 'age-related changes in the pronunciation of an L2 may derive from differences in how, or if, L2 learners perceptually relate L2 sounds to the sounds making up the L2 phonetic inventory' (p. 99). While this may explain why our age effects occur, it does not predict when in adulthood are those effects to be expected. Seright (1985:465), when finding similar age effects in her study on aural comprehension rate in the 20-30 age range, is careful to point out that these findings 'may be interpreted as suggesting only a faster initial rate of development in the listening for younger adults as compared with older adults'. Similarly, and in the present study, the only claim is that when the Group A sample is disaggregated by setting a cut-off point at age 24, the listening skill seems to behave differently from the other skills, showing slight benefits in listening for the younger age sub-sample. The point should be made too that further empirical evidence is necessary to determine that this lower performance in oral skills is generalisable to all learners in formal learning contexts –and whether that poorer performance may be attributed to a decrease in auditory acuity. Likewise, no claims are made for any possible differences or relationships which may exist for this particular skill in later stages of the learning process or in ultimate attainment. After all, the fact that no significant correlations with age have been found in Group B, after 416 hours of instruction, may be due to the small size of the sample.

For the second research question, which variables of our set impact the learning rate of our group of learners, and to what an extent, it was hypothesized that L1 literacy would be the stronger predictor of rate of acquisition for a group of adult learners of English as a second language in a formal learning context.

This hypothesis was confirmed for Group A, but not for Group B. Here, again, Group B's small sample size should be taken into account.

For the two categorical variables, sex and tertiary education, no significance was reached in the statistical analysis. In the case of tertiary education, as it has been previously discussed in the section about operationalisation of variables, a possible explanation for the lack of results is that the variable lacks internal validity, not describing accurately what it intends to depict; therefore the division is artificial and ineffective.

When examining learners with 200 hours of instruction (Group A), motivation was excluded from the regression models. Correlations had given a weak index, .28 for the cloze test, and .32 for the grammar test, so when it was factored in the regression model it did not account for any variance.

Eventually, L1 literacy was the variable which explained most of the variance in the regression model in all tests for learners after 200 hours of instruction, followed by previous foreign language proficiency, which impacted two test scores. It is unfortunate that our participants had not taken a language aptitude test, as this result can actually have two readings. On the one hand, one could claim that these results are indicative of language aptitude, as subjects scoring higher on the English tests also scored higher in the L1 tests and in their previously learnt languages' tests. This reading would be consistent with DeKeyser's findings in 2000, by which only adults with a high verbal ability were able to compensate the effects of age, or DeKeyser, Alfi-Shabtay and Ravid (2010), showing that in young adults aptitude predicted level of ultimate attainment. On the other, it could be interpreted as part of the academic proficiency developed in the L1 but underlying any other languages learnt by the subject (CALP[4]). It has been hypothesized that the cognitive/academic aspects of L1 and L2 are interdependent, and that the development of proficiency in L2 is partially a function of the level of L1 proficiency at the time when intensive exposure to L2 begins (Cummins 1980:118). Following this viewpoint, there is another striking parallelism in what Cummins (1980:125) called 'the entry

fallacy' in bilingual education and the situation of our adult learners when they enrol in a language school: 'it was initially implicitly assumed that students who were limited English proficient would be proficient in their mother tongue'. In an analysis of the BAF project data for an age range of 11 to 14, Muñoz (2001:259) reports L1 literacy as explaining most of the variance in the dictation and the cloze tests. Previous studies reporting correlations with L1 literacy including children and adolescents notwithstanding (Muñoz, 2001; Bialystok and Hakuta, 1999; Cummins, 1984, as cited in Singleton and Ryan, 2004), the L1 literacy results in the current study may be suggesting that the same kind of underlying L1 proficiency construct may be valid for adults at any age at low levels of proficiency. In this study in particular, this is the case after 200 hours of instruction. Usually, when an adult is having difficulties learning an L2, this is interpreted as that particular language being exceptionally challenging for the learner, while the level of academic development of his/her L1 remains unquestioned, in the same manner as in bilingual education it was unquestioned for limited English proficient students. The current study purports that in formal learning contexts, there is indeed a strong relationship between the degree of development of the L1 and the learner's performance in any other subsequent languages learnt, at least at low proficiency levels. This point is further reinforced by the fact that for these subjects English is technically the fourth language they learn, and the first one which does not belong to the Romance family of languages but to the Germanic family: Tragant (2006) reports adult Spanish/Catalan students perceiving learning English as especially challenging due to the language being especially complex, or hard to understand when spoken. Yet, for successful learners, their underlying academic proficiency proves stronger than the language family change and permits students with a high L1 proficiency to score high in their first non-Romance language tests too.

From the examination of learners after 416 hours of instruction emerges a totally different picture. Of all the variable set explored, only motivation shows a strong positive relationship with dictation, $r=.54$, and listening tests' scores, $r=.57$. This result needs to be treated with caution as, again, sample size is very small,

N=14. This result is in line with Dörnyei and Skehan's (2003:589) discussion of individual differences when they state that, together with language aptitude, motivation is one of 'the most consistent predictors of second language learning success'. Similarly, Moyer (1999), in her research involving highly motivated learners of German, reports a significant 41% of the variance in her subjects' outcomes in her regression analysis being explained by professional motivation. Also using a slightly broader sample of the adults in the BAF project, Tragant (2006) reports a change in the type of motivation as students move up the proficiency ladder: while at Time 1 the most frequent argument is instrumental or career-oriented with a 28.7% of the responses, at Time 2 this argument has increased to include 35.9% of the participants' answers. Tragant argues that this may be due to adult learners being more aware of the benefits that learning English can have in their professional development. The current study provides further evidence that motivation is a dynamic construct and that its contribution to learning success co-varies with hours of instruction.

5. Conclusions

Recall this paper's opening paragraph. In the literature, evidence has been provided that there are successful L2 learners who began acquiring their L2 after the putative end of the critical period (Birdsong, 1992; Bongaerts et al., 1997 and Ioup et al., 1994, as cited in Marinova-Todd et al., 2000). Similarly, researchers have reviewed the characteristics of the aging brain and how these can impact post-pubertal L2 learning (Birdsong, 2006; Singleton& and Ryan, 2004), inspired by the latest findings in psychology and neurobiology. Scholars seem to coincide in that there are certain biological aspects of the aging brain which may have an effect on L2 learning, such as declines in cerebral plasticity, gradual hearing losses, or declines in working memory; but they also agree that there is no evidence of a direct causal link or of the direction of such link between any biological factors and linguistic performance. In the meantime, exceptional

learners keep appearing and challenging the Critical Period Hypothesis predictions as well as the effects of the aging brain.

Seright (1985) concluded that loss of auditory acuity and a delayed reaction time to stimuli may have played a role in her older subjects scoring lower in aural comprehension tasks. However, she is careful to warn the reader that there is no empirical evidence of any of these declines taking place before age 40. An interesting suggestion that she makes is that there may have been psychological issues related to age that may have affected their performance, i.e. greater 'inhibitions and loss of self-confidence' (Seright, 1985:467).

Finally, Moyer's outlier (1999) had been largely self-taught and had not had any exposure to the target language before age 22, and yet he performed within native controls on the skill which the literature has considered as the most sensitive to aging: phonetics/phonology. Consider this one outlier from the Critical Period perspective: if an affective factor can override such a strong and widely accepted biological constraint, can that biological constraint exist at all? And if we consider the overall non-native performance as due to the loss in aural capacity in adults, the question remains the same: does it make sense that a limitation due to aging is overcome by an affective factor?

In summary, all these examples challenge the idea of a Critical Period ending abruptly at puberty, as well as of severe and ineluctable biological limitations caused by an aging brain, and should be taken seriously as evidence that L2 learning in adulthood is perfectly possible. There are factors other than age, or that co-vary with age (such as L1 literacy or motivation), which should be explored to better understand the adults' successful L2 learning process. This paper tried to shed light on some other such factors.

5.1. Pedagogical Implications

The first pedagogical implication to be drawn from this study is that, in the early stages of the learning process, listening tasks are challenging for students in

formal learning contexts and may need specific educational treatment. The good news is that oral skills have been proven as being amenable to training (Seright, 1985; Moyer, 1999). Thus, any program addressed to adults should contain a specific phonetic/phonological module which helps training their phonetic coding ability, as well as a suprasegmental training component. This is especially important in a foreign language learning context, where exposure to the target language is severely limited.

Secondly, the relationship between L1 academic proficiency and other languages learnt in life found is encouraging. As well as providing an explanation for the different starting points of learners, it gives the educator the opportunity to design appropriate curricula to match those academic needs. First postulated by Cummins as the Developmental Interdependence Hypothesis and the Threshold Hypothesis (1979:75), this view has been supported by Singleton and Ryan (2004:192) when they recognise that

> 'there is a fair amount of support in the literature for the general notion of a trade-off between L1 and L2 proficiency, and, to the extent that entrenched L1 proficiency at later ages may be taken to militate against the acquisition of high levels of L2 proficiency, this may bear on the question of L2 age effects;'

but, more importantly for educators, they also state that 'the acquisition of an L2 may be assumed to have an impact on L1 acquisition and use' (p. 192). Therefore, the careful planning of a syllabus aimed at not only developing the learner's level of English but at the development of their cross-language literacy skills at any age should be in the agenda of every language teacher.

Finally, the fact that no age effects have been found in our participants with the exception of in the listening comprehension task should be encouraging from the perspective of language lifelong learning. While this study suggests that indeed aural skills may be affected by age, the fact that no other skills are affected provides support for the idea that the adult learner does not face the learning task

more poorly endowed than the younger learner. By addressing the specific oral language development needs, caused by either the lack of massive exposure typical of formal acquisition contexts or by greater inhibition levels, adults can be as successful as any other learners in L2 acquisition.

5.2. Limitations of the study and Areas for Future Research

The main limitation of this study is sample size. In order to enhance the internal validity of the research, stringent criteria were applied to control for other languages previously learnt, for periods of earlier instruction in English and for exposure to English. This data trimming process greatly reduced the number of subjects, to the point where conducting regression analyses for Group B was not possible. Therefore, further research on adult L2 rate of learning should aim at gathering larger participant samples which allow for a comparison of variables at different stages of the learning process.

Another limitation of the study is construct validity, caused by the data available: tertiary education did not reflect what it was supposed to reflect due to the lack of biographical data. Further studies on adult learner variables which have the possibility of collecting data should make sure that the variables chosen respond to well-defined and theory-driven constructs.

A methodological suggestion for further research focusing on adults only would be to analyse participants by using a matched-pair samples methodology, as Seright (1985) did in her study on age and aural comprehension. By matching two subjects on a number of variables but age, the effects of the latter can be disentangled from other factors which are commonly confounded with age.

Finally, the author would like to speculate that, just as motivation has become a dynamic construct, there is a high possibility that the role played by the different variables in adult L2 learning in formal learning contexts is dynamic too, in that the weight which each one of the different variables will have in each of the different stages of the learning process will vary, possibly not as a function of

age but as a function of proficiency in the target language. To identify which
factors play a role and how do they vary along the learning process in longitudinal
studies is an ambitious agenda for future empirical research.

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[1] The terms learning and acquisition are used as synonyms in this paper despite the distinction made by Krashen between the two terms. According to Krashen, learning is a conscious process while acquisition is unconscious (see Krashen, 1982).

[2] From here onwards, the Barcelona Age Factor Project will be referred to as the BAF Project. There were four age groups in the original BAF project. Partially longitudinal, data collection extended from 1995 until 2002.

[3] In the rest of the paper the term L2 will be used to refer to the learning of English of these participants, although technically it will be their L3. Catalan and Spanish will be their two L1s, French their L2, and English their L3.

[4] CALP is defined as cognitive/academic language proficiency, as opposed to BICS, defined as basic interpersonal communicative skills. Initially formulated by Cummins in the context of bilingual education in Canada, CALP is used for those aspects of language proficiency related to literacy, while BICS is used in cognitively non-demanding situations of a communicative nature in which literacy hardly plays any role (see Cummins, 1980).

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Appendix A: Histograms with normality curves and Q-Q Plots for Group A and Group B

Group A

English Cloze Scores

Std. Dev = 4,38
Mean = 22,5
N = 51,00

English Dictation Scores

Std. Dev = 7,68
Mean = 35,0
N = 51,00

Multiple Choice Scores

Std. Dev = 7,10
Mean = 34,5
N = 51,00

Listening Scores

Std. Dev = 3,09
Mean = 15,0
N = 51,00
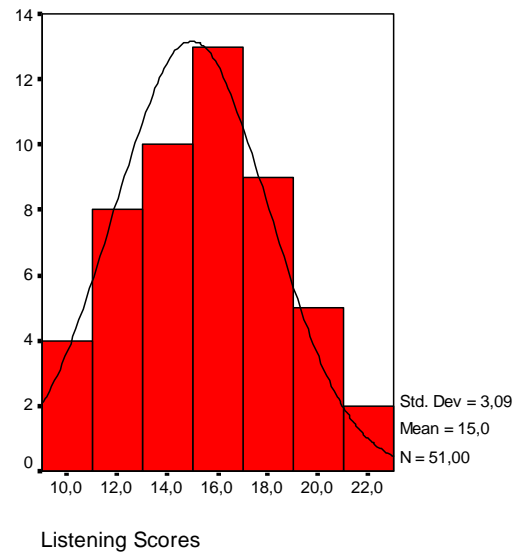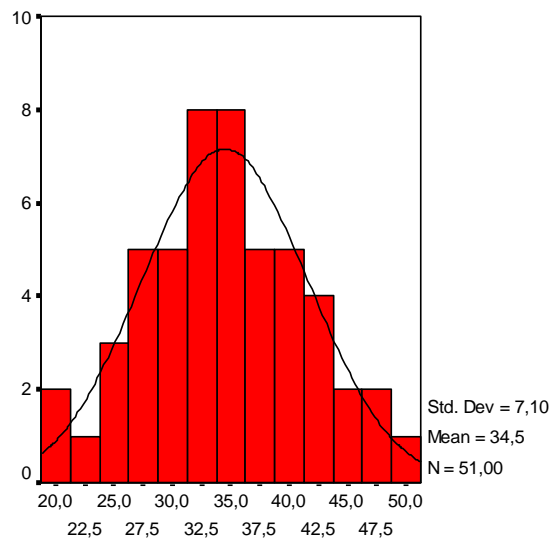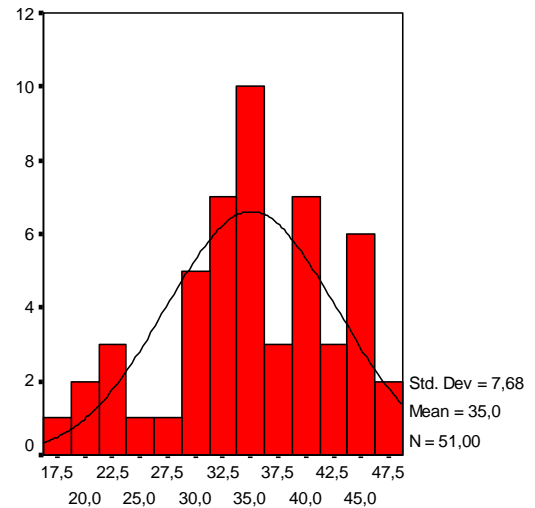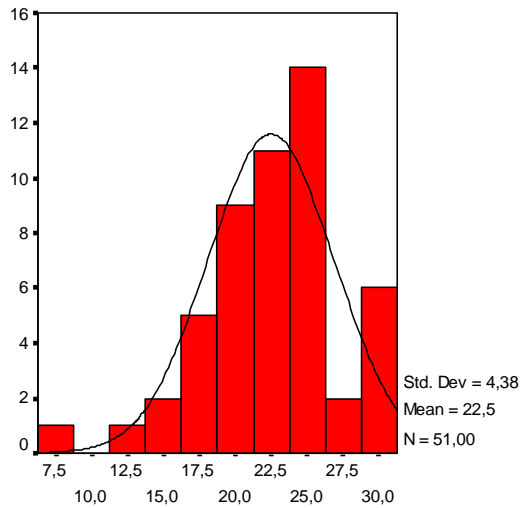
Normal Q-Q Plot of English Cloze Scores
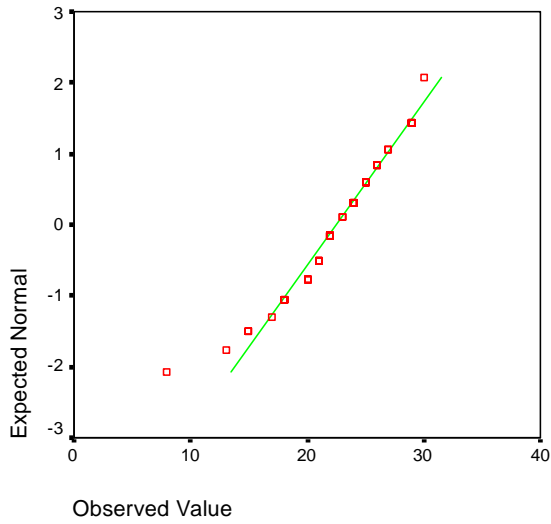
Normal Q-Q Plot of English Dictation
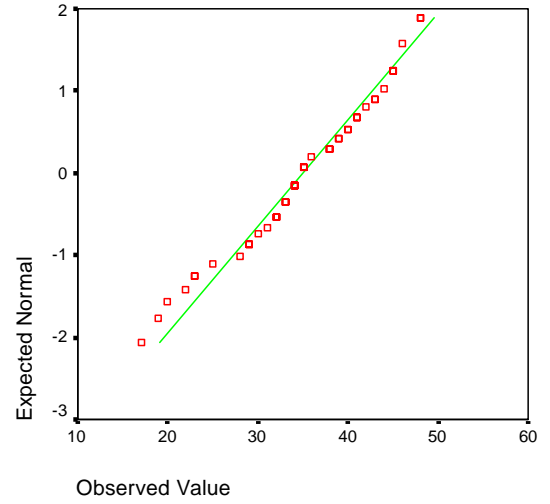
Normal Q-Q Plot of Multiple Choice
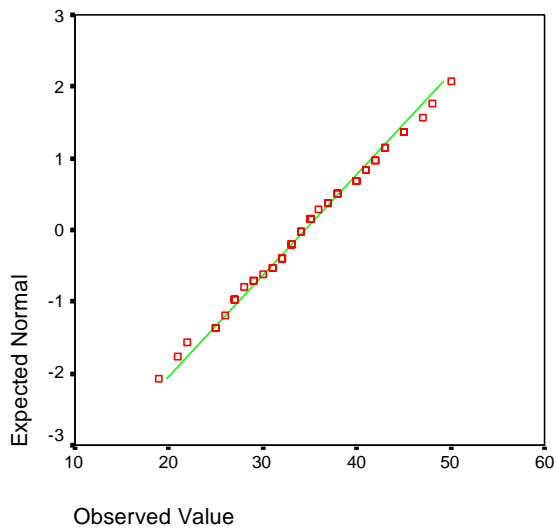
Normal Q-Q Plot of Listening Scores
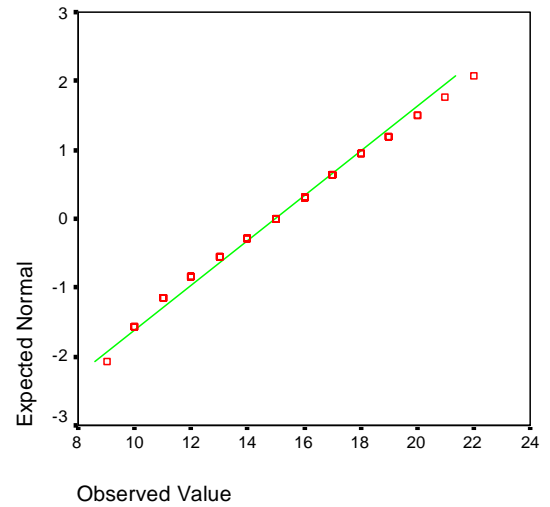
Group B:
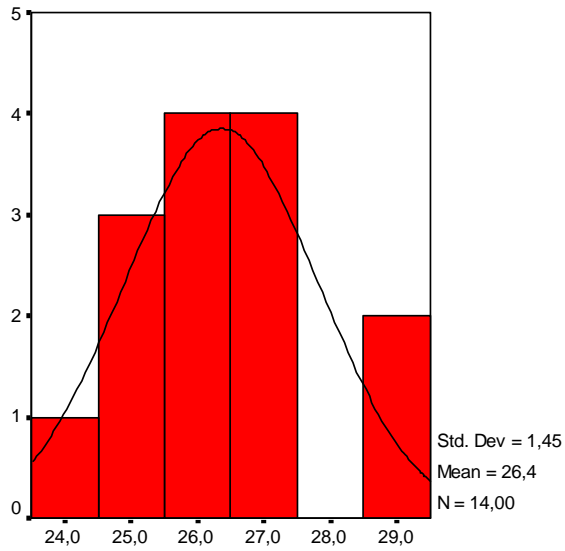
English Cloze Scores

Std. Dev = 1,45
Mean = 26,4
N = 14,00

English Dictation Scores

Std. Dev = 5,12
Mean = 42,9
N = 14,00

Multiple Choice Scores

Std. Dev = 4,54
Mean = 42,6
N = 14,00

Listening Scores

Std. Dev = 2,64
Mean = 19,7
N = 14,00

Normal Q-Q Plot of English Cloze S...

Normal Q-Q Plot of English Dictatio...

Normal Q-Q Plot of Multiple Choice...

Normal Q-Q Plot of Listening Score...
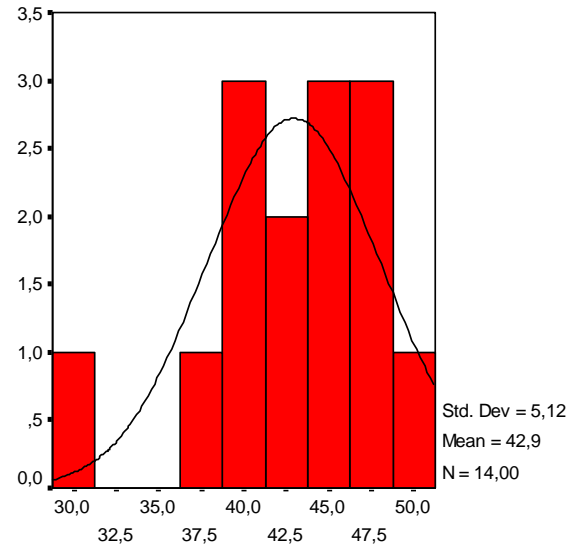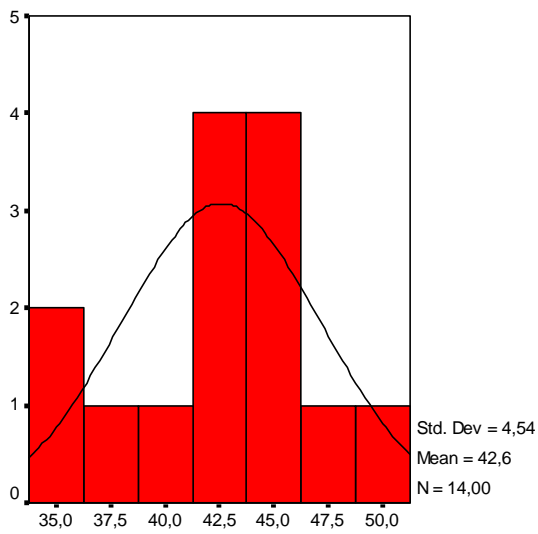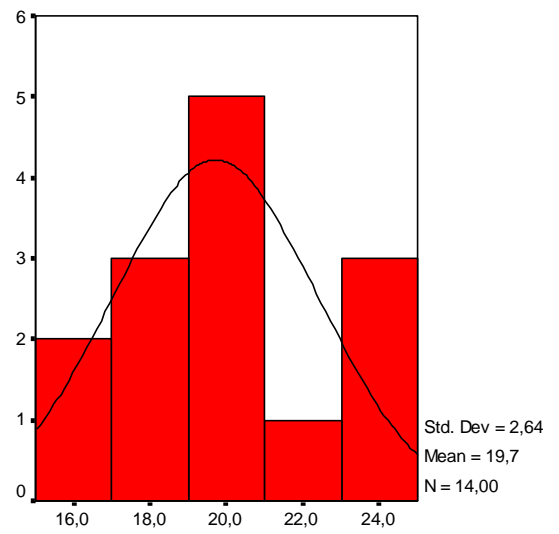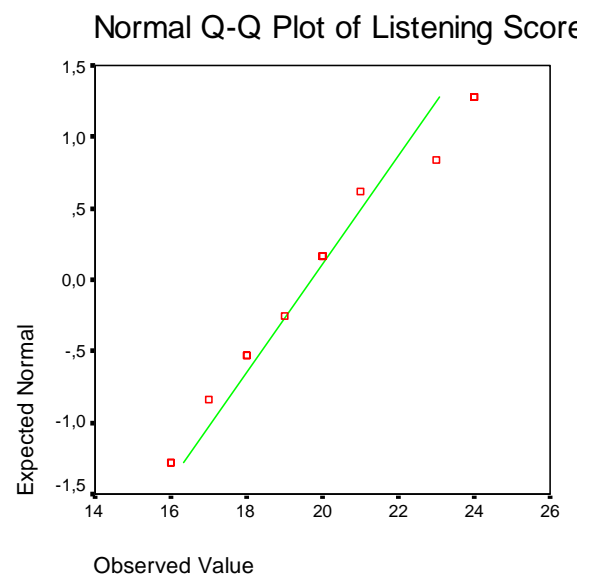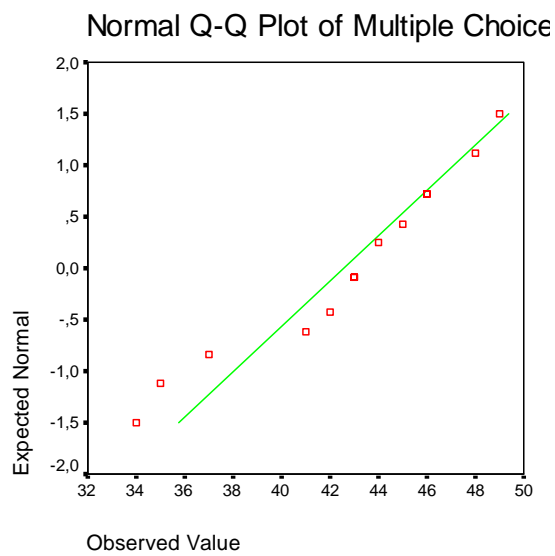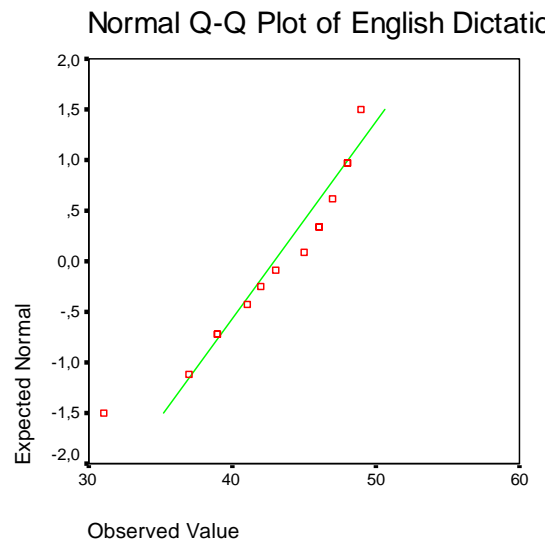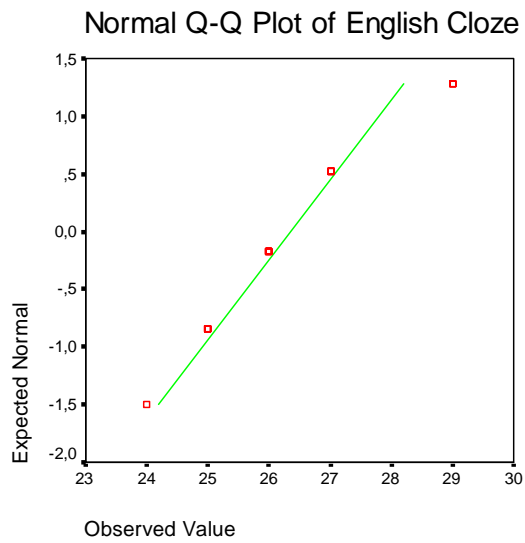
Appendix B: Scatterplots with Linear Regression Lines for Age of First Instruction

Linear Regression

English Cloze Scores = 24.32 + -0.07 * age1inst
R-Square = 0.01

English Cloze Scores

Age of First Instruction in English

Linear Regression

English Dictation Scores = 37.83 + -0.10 * age1inst
R-Square = 0.01

English Dictation Scores

Age of First Instruction in English

Linear Regression

Multiple Choice Scores = 33.31 + 0.04 * age1inst
R-Square = 0.00

Age of First Instruction in English

Linear Regression

Listening Scores = 15.85 + -0.03 * age1inst
R-Square = 0.01

Age of First Instruction in English

Appendix C: Testing the Assumptions of Manova

Sample size assumptions were met, as the minimum of cases necessary for each one of the cells was 4 (our number of dependent variables), and in our analysis all cell subject numbers were higher than 4.

Multivariate normality was checked by calculating Mahalanobis distances: for our number of dependent variables (4), the critical value we had to compare our maximum Mahalanobis distance to was 18.47. Our maximum value was 16.14.

Box's Test of Equality of Covariance Matrices' significance was .314, larger than .001, so the assumption of homogeneity of variance-covariance matrices was not violated.

Finally, Levene's Test of equality of variances was above .05 for all the dependent variables, so equal variances could be assumed.

Appendix D: Assumptions met and scatterplots generated for each one of the regression analyses.
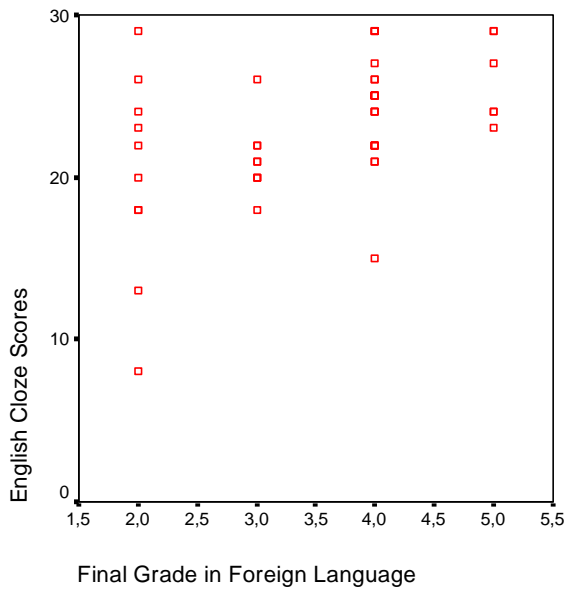
Assumptions:

The assumption of no multicollinearity was met as the independent variables were not highly correlated, the highest correlation being $r=.31$ $p=.05$ between motivation and L1 literacy, well below the $r=.9$ critical value.
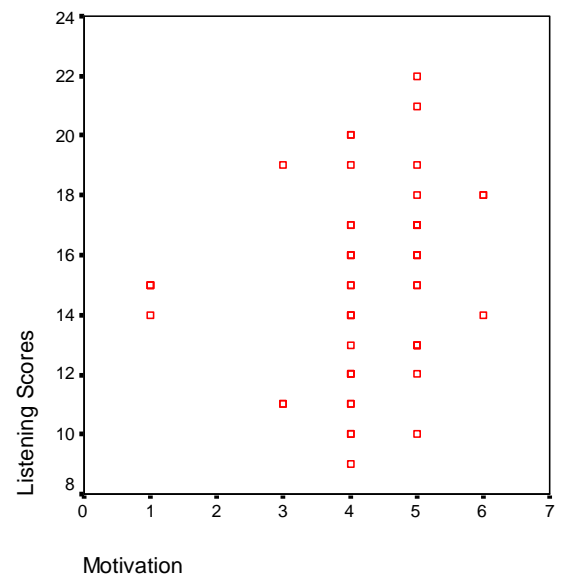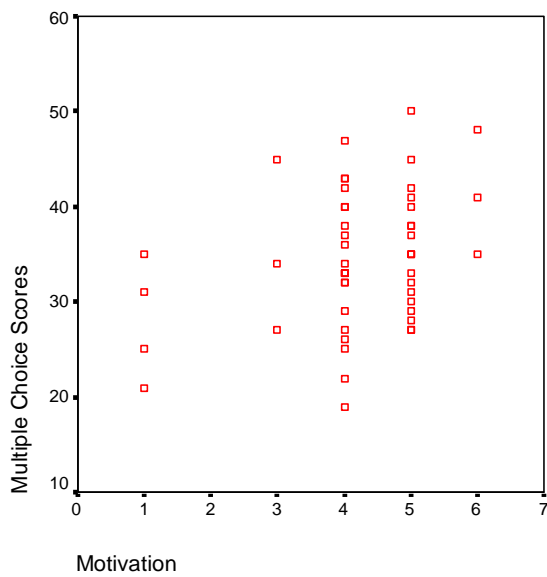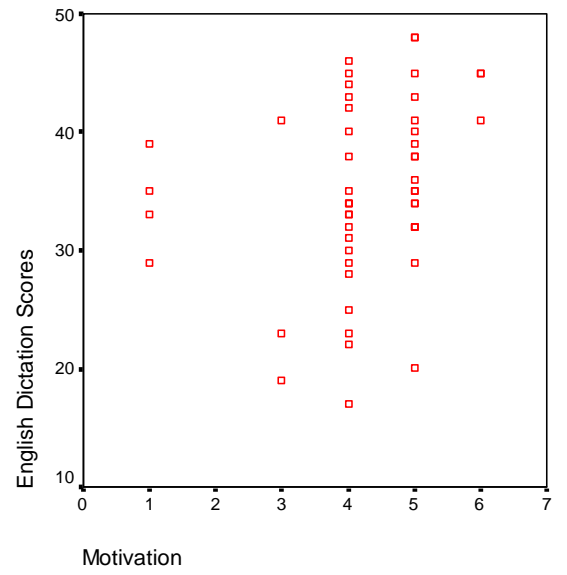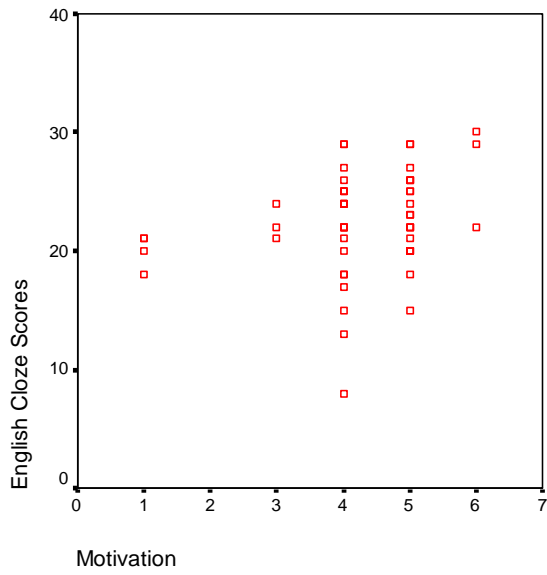
The presence of outliers was checked for each one of the dependent variables by inspecting the standardised residuals: in none of them its value was higher than 3.3. or lower than -3.3, so there were no outlying residuals in our data.

Scatterplots:

Final Grade in Previous Foreign Language:

Motivation:

L1 Literacy: