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Original article

Foreign Language Aptitude Examined in relation to Implicit and Explicit Grammar Instruction

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Abstract

Language aptitude (LA) is one of the primary individual differences with which the language learning ability of learners can be foreseen. This quasi-experimental study aims to contribute to the LA literature by investigating the role of LA in explicit and implicit grammar instruction. To do so, LLAMA_D aptitude test was administered to 133 participants, and from this cohort group, four subgroups were formed. A one-session course was designed and delivered to participants with a pre and post-test. The results indicated that there is a significant correlation between implicit instruction and the LA level of the participants. However, based on the Pearson Correlation results, it can be concluded that LA is a stronger determinant in the achievement of learners than the type of instruction. It can be suggested, therefore, that taking LA level into consideration before planning implicit or explicit instruction would contribute to the effectiveness of the instruction.

Keywords: Language Aptitude, Implicit Instruction, Explicit Instruction, LLAMA Aptitude Tests.

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INTRODUCTION

The language learning process is affected by several internal and external factors. Individual differences (ID) of the learners are among the most significant factors that shape the language learning process. Skehan (1991) asserts that language aptitude, learner strategies, learner styles and motivation can be listed as the most prominent individual differences. By its nature, language aptitude has distinctive features when compared to other skills. It is directly related to the language learning ability of learners (Bachman, 1990), and it offers evidence on the language learning potential of individuals. Thus, language aptitude deserves specific focus in language research.

One major problem with language aptitude is that it is the least-studied individual differences area after learning strategies, learning styles and motivation, especially from the experimental perspective. There are several reasons for this. First, the measurement of language aptitude is more complicated than other ID areas. Currently, language aptitude can only be measured by professionally-designed aptitude tests such as the Modern Language Aptitude Test (Carroll & Sapon, 1959), Pimsleur Language Aptitude Battery (Pimsleur, 1968), Defence Language Aptitude Battery (Petersen & Al-Haik, 1976) and LLAMA Language Aptitude Test (Meara, 2005). Secondly, there is still no consensus on the concept of language aptitude. While Carroll (1981) suggests that language aptitude is a strong determiner of language learning ability and unaffected by environmental factors and cognitive processes, Higgs and Krashen (1983) argue that language aptitude can only measure grammatical sensitivity in conscious-learning settings and would not work in natural communicative settings. Similarly, VanPatten and Smith (2015) consider that language aptitude and explicit instruction are interrelated. On the other hand, Skehan (2016) proposes that language aptitude has a vital role through the all acquisition process.

Another point that needs to be addressed is the role of language aptitude in differentiated instruction (DI). DI promises modified and adjusted instruction that meets the needs of the learners based on their individual differences (Tomlinson, 2003). In their prominent study, Ehrman and Oxford (1995) state that among ID variables, aptitude is the one most strongly correlated with L2 proficiency. In this respect, considering the language aptitude levels of the learners for the type of instruction would contribute to the effectiveness of the instruction. However, the effect of language aptitude on the type of instruction is still controversial. Higgs and Krashen (1983) consider that language aptitude is related to learning, not acquisition, and it makes sense for explicit instruction.

On the other hand, Ortega (2013) posits that language aptitude contributes to success under implicit learning conditions. Moreover, several experimental studies verified the effectiveness of language aptitude on implicit instruction (Erlam, 2005; Nation & McLaughlin, 1986; Robinson, 2002; Williams, 1999) and explicit instruction (de Graaff, 1997; Robinson, 1996; Sheen, 2007). These studies will be elaborated upon in the literature review section. This disagreement between researchers reveals the need for experimental studies on language aptitude.

Language aptitude is not a unidimensional construct but comprises sub-components such as phonemic coding ability, grammatical sensitivity, inductive language learning ability and rote-learning ability, as suggested by Carroll (1981). After Carroll, the perspective on language aptitude changed from being product-oriented to process-oriented (Ellis, 2015, p. 43) and new models were introduced. For instance, Skehan (2002) proposed new stages for language aptitude such as noticing, patterning, controlling and lexicalising while Robinson (2002) introduced 'aptitude complexes' which have contributed much to aptitude theory. One major milestone in language aptitude studies in this period was the integration of Baddeley's (2003, p. 34) 'working memory' concept into language aptitude. Baddeley defines working memory as the cognitive system that temporarily holds information in the brain during cognitive tasks. Ellis (2015, p. 45) highlights the importance of working memory for language learning, stating that learners who have a larger working memory capacity, in other words, short term memory, will be able to store more linguistic data, and adds that working memory is very appropriate for implicit instruction.

Within this framework, the emerging themes are language aptitude, explicit-implicit instruction, and working memory (short term memory). In this respect, this study aims to contribute to the literature by conducting a quasi-experimental study on the role of language aptitude in implicit and explicit instruction. This research is guided by the following research questions:

- Is there any significant difference between the post-test scores of the groups based on the type of instruction they receive (explicit or implicit) and their aptitude level (high or low)?
- Is there any correlation between language aptitude scores and the post-test scores?

Language Aptitude and Grammar Instruction

The effectiveness of different types of grammar instruction has long been the concern of researchers. The most controversial and intriguing one is the explicit-implicit debate. In the early 1990s, the focus of the implicit-explicit debate evolved around the language aptitude. In this section, the experimental studies that have a particular focus on language aptitude and explicit-implicit instruction will be presented in chronological order so that the historical evolution of the studies can be tracked systematically. Only the primary focus and the main findings of the studies will be mentioned. More detailed information related to the studies will be presented in Table 1 at the end of the section.

Experimental studies on the effect of language aptitude in implicit and explicit learning conditions can be regarded as relatively new. In the early 1990s, the studies were mainly governed by the relationship between intelligence and aptitude. In 1991, Reber, Walkenfeld and Hernstadt conducted a study to explore the degree to which individual differences, particularly intelligence, were affected by implicit and explicit instruction. It is worth noting that aptitude and intelligence were overlapping concepts until the mid-1990s when Sasaki (1996) empirically showed that language and intelligence

were different constructs, although related. Their study found that the scores of the explicit group strongly correlated with intelligence scores, while no correlation was recorded for the implicit group. In the first half of the 1990s, discrimination between intelligence and aptitude was established and a correlation between explicit instruction and intelligence was determined.

From the second half of the 1990s to the first half of the 2000s, several studies were conducted with a special focus on grammatical sensitivity. De Graaff's (1997) study was based on discovering the effectiveness of explicit instruction on complexity and morphology/syntax in the acquisition of L2 structures. One of his hypotheses was specifically on the role of language aptitude in this process. He concluded that language aptitude had no effect on the test performance of the participants under explicit or implicit conditions, and an equal correlation was reported between aptitude scores and test performance scores.

Peter Robinson conducted several subsequent studies on the relationship between language aptitude and implicit-explicit instruction. In one of his early studies, Robinson (1995) set out to find evidence for Krashen and Reber's ideas that language aptitude works best under explicit conditions. His experimental study yielded a significant positive correlation between the aptitude scores and performance scores regarding learning easy and hard grammar rules for participants in the implicit group. One year later, Robinson (1996) repeated the same study without incorporating language aptitude as a variable, and found that the learners in the implicit group did not outperform the others in complex grammar rules, which contradicts the previous study. The second study confirms the effect of language aptitude in implicit instruction though he does not directly count aptitude as a variable in the study. The next study of Robinson (2005) was a replication of Reber, Walkenfeld, and Hernstadt (1991) in which they concurred that the effectiveness of explicit instruction was bound to intelligence scores. Robinson (2005) made some adjustments, and he added the language aptitude scores of the participants along with the intelligence scores. This time, intelligence scores were negatively correlated with implicit instruction scores, while aptitude scores positively correlated with explicit instruction scores. Overall, the studies in this period fell short in reaching a consensus on the most effective grammar instruction type based on language aptitude.

Beginning from the second half of the 2000s, the implicit-explicit inquiry was mainly characterised by the concept of working memory. Erlam's (2005) study compares three instruction groups (deductive instruction, inductive instruction, and structured input instruction) with three language aptitude components (language analytic ability, phonemic coding ability and working memory). She concluded that aptitude scores did not correlate significantly with the performance scores of the participants, whereas the participants in the explicit group did well in most parts. In another study, Sheen (2007) approached language aptitude from the written feedback perspective and examined the effect of language aptitude on direct-only (explicit) and direct-metalinguistic (implicit) correction

feedback over a control group. The results showed that both groups outperformed the control group, but the implicit group outperformed the explicit group in the delayed post-test. She concluded that implicit feedback is beneficial when learners have high language analytic abilities.

The study of Tagarelli, Mota, and Rebuschat (2011) particularly focused on language aptitude from the working memory perspective. Two groups (implicit and explicit) were trained on a semi-artificial language and were tested on the syntactic level. The test results yielded no significant correlation between the grammatical judgement task and working memory scores. They concluded that language aptitude, specifically working memory, may be more predictive in explicit conditions. The study of Yilmaz (2012) also focused on the effect of language aptitude (particularly working memory and language analytic ability*)* on feedback type (explicit and implicit). Contrary to other studies, he used Turkish as the target language and LLAMA aptitude tests. Another unique feature of this study is that the treatment lasted for one session only. Under these circumstances, the results indicated that explicit correction works better when participants have both high working memory capacity and language analytic ability.

Another feedback-based study was conducted by Li (2013). This study has a similar structure with Sheen's (2007) study. However, Li (2013) added one more component (working memory) as a variable. The study produced similar findings to Sheen (2007) in that both determined the effectiveness of language analytic ability in implicit conditions. Moreover, Li (2013) found that working memory mediated the effects of explicit feedback. Lastly, Artieda and Muñoz (2016) investigated the effectiveness of language aptitude on L2 proficiency based on the proficiency level of the participants. The participants were divided into two groups (beginner and intermediate) and were administered four components of LLAMA aptitude tests. Rather than applying implicit or explicit instruction, they relied on the LLAMA tests' assumptions that LLAMA_B, LLAMA_F and LLAMA_E measure explicit learning capacity while LLAMA_D test measures implicit learning capacity. The results indicated that overall aptitude scores significantly correlated with each group's proficiency scores (r = .39). However, based on the sub-components of the LLAMA tests, LLAMA_D (implicit capacity) was only significant for the beginner group. These studies clearly show that when the focus is on working memory, language aptitude highly influences explicit grammar instruction.

The framework above suggests that language aptitude is not a stable entity. Instead, it is highly influenced by contextual factors in terms of implicit and explicit instruction. It is evident that more experimental research is needed to discover the connection between language aptitude and instruction type.

Table 1. Summary of Research on Language Aptitude from Implicit and Explicit Perspective

Study	**Aptitude Area**	**Participants *N***	**Age**	**Measurement Tool**	**Effective Instruction**
Reber, Walkenfeld and Hernstadt (1991)	Intelligence	20	20-24	Well-formedness Task (Explicit) Forced-choice task (Implicit) WAIS-R IQ Test	Explicit
de Graaff (1997)	Grammatical Sensitivity	56	20-24	MLAT	None is effective
Robinson (1995)	Grammatical Sensitivity	94	19-34	MLAT	Implicit
Robinson (2005)	Grammatical Sensitivity Phonemic Sensitivity	54	19-24	LABJ	Explicit
Erlam (2005)	Language Analytic Ability Phonemic Coding Ability Working Memory.	60	*M* = 14	MLAT and PLAB	Explicit
Sheen (2007)	*Language Analytic Ability*	111	21-56	LAAT	Implicit
Tagarelli, Mota, and Rebuschat (2011)	*Working Memory*	62	*N/A*	OWST and LNOT	Explicit
Yilmaz (2012)	*Working Memory* *Language Analytic Ability*	48	*M* = 24	OSPAN and LLAMA_F	Explicit
Li (2013)	*Working Memory* *Language Analytic Ability*	78	18-38	MLAT	WM: Explicit LAA: Implicit
Artieda and Muñoz (2016)	Phonemic Coding Ability *Language Analytic Ability*	140	*M* = 39.6	LLAMA	Implicit

*WAIS: Wechsler Adult Intelligence Scale, MLAT: Modern Language Aptitude Test, LABJ: Language Aptitude Battery for the Japanese, PLAB: The Pimsleur Language Aptitude Battery, LAAT: Language Analytic Ability Test, OWST: Operation-Word Span Task, LNOT: Letter-Number Ordering Task, OSPAN: Operation Span Task

METHODS

Aim and Scope

This quasi-experimental study aims to explore the role of language aptitude in explicit and implicit grammar instruction. The scope of the study is limited to working memory capacity (short-term memory) in terms of language aptitude. Also, the treatment duration is purposefully kept short (one session) bearing in mind Carroll's (1959) assumption that language aptitude is best measured in short treatments. Another rationale behind why the working memory component was chosen is that short term memory capacity is regarded as sufficient to predict the language acquisition capacity of learners (Ellis, 1996).

Participants

At the start of the study, 133 participants were administered LLAMA_D aptitude test in order to form the groups of the study. From this cohort, learners who had low scores based on grades in the LLAMA_D test (score ≤ 10) were identified (n = 14). Correspondingly, 14 students who achieved high scores (score ≥ 40) were selected to keep the balance between groups. The groups were labelled as High Aptitude (HA) and Low Aptitude (LA) groups. Then, the within-group division was made according to the instruction type. Each group was divided into two groups, as receiving explicit instruction or implicit instruction. The participants were freshman university students at a public university in Turkey, and their English language level was A1. Table 2 gives the groups' demographics.

Table 2. Details of the 4 Study Groups

Group Name	Code	n	LLAMA_D M	SD	Age M
High Aptitude Explicit Instruction	HAE	7	50.71	8.38	20
High Aptitude Implicit Instruction	HAI	7	50.71	5.35	20
Low Aptitude Explicit Instruction	LAE	7	11.43	11.44	20
Low Aptitude Implicit Instruction	LAI	7	9.29	12.40	20

Data Collection Tools

This study adopted two data collection tools, one for language aptitude and one for grammar achievement. LLAMA_D sub-test was used to collect data for the language aptitude scores of the participants. The LLAMA Aptitude Tests were developed by Meara (2005), and they measure language aptitude recognising four tasks: A vocabulary learning task, a sound recognition task, a sound-symbol correspondence task and a grammatical inferencing task. The tests are computer-based and make use of an artificial language to measure the language aptitude capacity of the participants. LLAMA Aptitude Tests are currently the sole appropriate aptitude test for Turkish learners since other aptitude tests were developed for English speakers or designed in such a way as using features of the Turkish language.

The reason the LLAMA_D test was chosen is threefold. Firstly, LLAMA_D tests measure short term capacity and sound recognition, and this ability addresses the early stages of L2 development (Skehan, 1998). The participants of this study were A1 level English learners. Secondly, while the other components of LLAMA are related to explicit instruction, LLAMA_D is considered to measure implicit learning (Rogers, Meara, Barnett-Legh, Curry, & Davie, 2017). Thirdly, Meara (2005) posits that "LLAMA_D test measures the ability to recognise the repeated patterns which help learners to recognise the small variations in the endings that languages use to signal grammatical features". LLAMA_D test was administered to all participants in one-on-one sessions.

To measure grammar achievement, a pre-post-test design was planned. The same exam paper was used in pre- and post-tests. The exam paper included two parts. The first part included five translation questions from Turkish to English to check the participants' full understanding of language structures. The second part contained fifteen multiple-choice questions. Seven options were offered for each multiple-choice question to reduce the effect of choosing the correct answer by chance.

Procedure

This study was motivated by the need for more experimental research on language aptitude. The research was designed as a quasi-experimental study. To form the groups, a cohort group was convened (N = 133), and participants were administered LLAMA_D aptitude test in one-on-one sessions. From this cohort group, those who had the lowest scores (score ≤ 10) were selected, and they constituted the Low Aptitude group (n = 14). Then, the best-scoring 14 students (score ≥ 40) were chosen as the High Aptitude Group (n = 14). After the formation of the main groups, each group was divided into two sub-groups, as implicit instruction group (n = 7) and explicit instruction group (n = 7). At the end of this process, four groups were formed.

In order to decide which grammar structures were to be taught, a couple of structures that could be taught both explicitly and implicitly were listed, and students were asked if they had ever seen these structures before. All students reported that they had never seen the 'comparatives' structure; therefore, comparatives was chosen as the treatment structure.

Two one-session courses were designed considering the features of implicit and explicit instruction. For explicit instruction, a PPP model (Presentation, Practice, Production) course design was prepared. The rules were overtly given and then practised. For the implicit instruction, the ESA model (Engage, Study, Activate) was adopted as the course design. First, learners were engaged in the topic; then the structure was studied covertly without giving the rules. Thus, students were encouraged to discover the rules during the instruction process. At the beginning and the end of the course, a pre-test and post-test were administered to the participants.

After the data collection process, Jamovi (2019) software (Version 9) was used to analyse the data. First, whether a significant difference between groups existed was determined by One-Way ANOVA test, and the direction of difference was analysed with Tukey post-hoc test. Second, Pearson correlation analysis was applied to reveal whether there was a correlation between aptitude scores and post-test scores.

Findings

RQ-1: Is there any significant difference between the post-test scores of the groups based on the type of instruction they received (explicit or implicit) and aptitude level (high or low)?

In order to find out if there was a significant difference between the post-test scores of the groups, the One-Way ANOVA test was used. Results are illustrated in Table 3.

Table 3. One-Way ANOVA Results between Groups

***N* = 28 (*n* = 7 for each)**	***M***	***SD***	***F***	***df1***	***df2***	***p***
LAI	38.6	30.8	4.82	3	24	.01
HAI	87.9	13.8				
HAE	71.4	28.1				
LAE	70.0	23.1				

One-Way ANOVA analysis results indicate that there is a significant difference in the post-test scores of the groups (F (3, 24) = 4.82, p < .01). To find the group-based significant difference, Tukey post-hoc test was used, and the results are shown in Table 4.

Table 4. Tukey Post-hoc Results

		LAI	**HAI**	**HAE**	**LAE**
LAI	Mean difference	—	-49.3	-32.9	-31.43
	SE	—	13.26	13.26	13.26
	p	—	.01***	.089	.110
HAI	Mean difference		—	16.4	17.86
	SE		—	13.26	13.26
	p		—	.609	.543
HAE	Mean difference			—	1.43
	SE			—	13.26
	p			—	1.000

Note. * p < .05, ** p < .01, *** p < .001

Tukey post-hoc results revealed that the only significant difference was between the Low Aptitude Implicit Instruction group and High Aptitude Implicit Instruction group (*MD* = -49.3, *SE* = 13.26). The results, therefore, indicate that language aptitude and implicit instruction are interrelated.

RQ-2: Is there any correlation between language aptitude scores and post-test scores?

In order to establish whether there is a correlation between language aptitude scores and post-test scores, Pearson correlation analysis was carried out, and the results are presented in Table 5.

Table 5. Correlation Matrix of Language Aptitude Scores and Post-Test Scores of Groups

		LAI	HAI	HAE	LAE	Overall
Post-Test	r_p	.19	.08	.61	.11	.50**
	p	.69	.86	.14	.81	.01

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

According to Pearson correlation results, there is a moderate positive correlation between the overall language aptitude scores and post-test scores $r_p(28) = .50$, $p < .05$ while no significant correlation is observed between the aptitude scores and post-test scores of the groups.

Discussion

As mentioned in the literature review section, many studies have attempted to validate particular assumptions of language aptitude through experimental studies. The assumptions that this study took into consideration were: (1) implicit instruction addresses best those students who have a high language aptitude level (Rogers et al., 2017), (2) LLAMA_D test is a novel language aptitude test that can measure implicit learning ability and foresee the grammar learning ability of learners (Meara, 2005), (3) Working Memory, in other words short-term memory, is directly related to implicit learning (Ellis, 2015), which can be measured by the LLAMA_D test. This quasi-experimental study was designed in order to find evidence to support or reject the above assumptions.

The first research question sought evidence to determine whether there was a relationship between the groups based on the aptitude level of the participants and their instruction type. One-Way ANOVA analysis indicated a significant difference and Tukey post-hoc test found that the direction of difference was between the Low Aptitude Implicit Instruction group and the High Aptitude Implicit Instruction group. The results clearly indicate the effect of language aptitude, specifically short-term capacity and sound recognition, on implicit instruction, which validates the assumptions of Rogers et al. (2017) and Meara (2005). This finding also testifies to the findings of Sheen (2007), Li (2013) and Artieda and Muñoz (2016) but contradicts the findings of Reber, Walkenfeld and Hernstadt (1991), Robinson (2005), Erlam (2005), Tagarelli, Mota, and Rebuschat (2011) and Yilmaz (2012) since they found that language aptitude works best in explicit learning conditions. These findings show that the first assumption, that implicit instruction addresses best students who have a high language aptitude level (Rogers et al., 2017), can be accepted. As for the LLAMA_D test, it can be accepted that the LLAMA_D aptitude test successfully measures grammar learning ability in implicit learning conditions. This finding also validates the third assumption since LLAMA_D was shown to measure the working memory capacity of the learners (Maera, 2005).

Correlation analysis also revealed valuable insights. Post-test results only correlate with the overall aptitude results, not the group-based aptitude results. Although One-Way ANOVA results suggest that the implicit instruction type played a role in the scores of learners based on their aptitude levels, correlation analysis revealed that aptitude level is a stronger determiner in the achievement of learners than the type of instruction.

Conclusion

Among other individual differences, language aptitude occupies a special place in language instruction in that it offers a tangible forecast related to the language learning pace of learners (Carroll, 1990). This perspective makes us consider whether language learning may be more effective and efficient when learners' language aptitude levels are taken into consideration in all phases of instruction from planning to implementation and evaluation. On this point, the problem with language aptitude is that researchers have only just started 'scratching the surface' (Ortega, 2013) and there is a long way to go to delve into the realities of language aptitude. From this viewpoint, it can be stated that the language aptitude phenomena require far more experimental studies which will shed light on one or more aspects of it. Therefore, this study attempts to contribute to the theory of language aptitude by investigating the relationship between language aptitude and instruction type.

The relationship mentioned above has been the focus of several researchers. However, their findings indicate discord on this issue. This leads to the emergence of a need to question why the studies yield different results, even when they use the same research design. Carroll (1990) asserts that language aptitude is a fixed, innate ability not affected by educational training or environmental factors. Nevertheless, it is worth investigating the role of contextual factors on language aptitude. Otherwise, these studies would not go beyond being just another brick in the wall.

This study provided evidence to add to the literature on language aptitude in two ways. First, it showed that implicit instruction and language aptitude are interrelated. Hypothetically, explicit instruction is the standard method of teaching in which every learner can progress to some extent by merely paying attention, regardless of their language aptitude level. Nevertheless, implicit instruction may not be appropriate for everyone and may work best under specific circumstances, such as possessing a good, innate aptitude for languages. This may find resonance in the course planning process. Insisting on the 'one size fits all' notion or delivering the course to 'wrong' learners in 'a wrong way' may directly hinder the effectiveness of the course.

Secondly, it is evident that language aptitude level, particularly short-term memory capacity, acts as a more critical construct in the achievement of the learners than the kind of instruction. It can be argued that language aptitude is the determiner, but instruction type is the facilitator in the language learning process. To conclude, this study validated the effect of language aptitude in the language

learning process. Moreover, it revealed that implicit grammar instruction suits best those students who already have a high language aptitude.

Recommendations for Further Studies

This study has some limitations. First, the study had to be conducted with a relatively small sample size (N = 28) because from the cohort group on which the LLAMA_D aptitude test was administered, only 14 participants were identified as having low aptitude scores according to the scoring guidelines of LLAMA (very poor score ≤ 10; average score between 15-35; good score between 40-60; outstanding score ≥ 75). With the corresponding 14 participants from the top of the list and 14 participants from the lowest scores, the total number of the participants was 28. Further studies can be conducted with larger sample sizes. One recommendation here is that, since the relationship between language aptitude and academic achievement is evident, LLAMA tests can be administered to students who have the highest and the lowest GPA scores in order to save time and money and identify only the potentially high and low scoring students in the LLAMA tests.

Another limitation of the study was the duration of the treatment. The treatment was purposefully designed as a one-shot course design adopting Carroll's (1959) assumptions. He assumed that language learning is a matter of time and opportunity. Everyone can learn when they are given time and opportunity. Language aptitude is basically related to how rapidly individuals learn a language. Thus, Carroll himself restricts the treatment duration to one-week so that the aptitude measurement is not contaminated by other factors. Further studies may address different treatment durations and explore the difference between duration times.

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